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Analysis of Thought Processes Involved in Solving Clinical Problems

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AN ANALYSIS OF THOUGHT PROCESSES INVOLVED IN SOLVING CLINICAL PROBLEMS

by

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LIFE

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CHAPTER I

STATEMENT OF THE PROBLEM

Psychologists have, for many years, done a great deal of speculating about the thought processes involved in problem solving behavior. They have tried to determine how correct solutions were achieved and what caused failures. However, the traditional approaches have not permitted the psychologist to examine processes extensively and little can be said about how the problem solver actually works. The purpose of this research is to attempt to validate a new technique--one that will allow a more refined analysis of thinking rather than evaluating merely the end product. In particular, this study will focus on the processes involved in the solution of clinical problems.

A problem has been aptly defined by Duncker who states that, "a problem arises when a living creature has a goal but does not know how this goal is to be reached" (Duncker, 1945, p. 112). In attempts to understand how persons solve problems psychologists have asked the subject to think aloud or introspect while working. However, this approach presented

numerous difficulties; for one thing the observer could never be certain that others would observe the same things he did. Semantic difficulties arose and without the existence of good experimental conditions adequate controls were not possible.

When psychological tests were developed a great improvement was made as far as control of certain variables is concerned, but no method was provided for analyzing the thinking occurring in the subject as he solves problems.

With the advent of psychological tests it became common practice to present a problem and then offer a number of multiple choice items. One is selected as being correct and it is assumed that all wrong answers have nearly the same chance of being selected. However, there is evidence to suggest that this assumption is not correct. Rimoldi (1945) found, while standardizing the Raven Progressive Matrices Tests for South Americans, that certain wrong answers were selected with much greater frequency than others. Further analysis of the results showed that the selected wrong answer was not necessarily blindly chosen, but was instead related to "problems of perceptual and spatial organization, 'aesthetic' factors, counting, effect of previous items" (Rimoldi, 1945 p. 3). This research also raises the question as to whether all wrong answers might be considered equally wrong.

It is felt that use of the current technique, developed by Rimoldi (1955) to appraise medical diagnostic ability, will circumvent many of the previous shortcomings. The basic rationale of the technique has been extended since its first use by Rimoldi (1956) to study medical diagnosis. The technique involves the presentation of a problem that is to be solved by asking questions. A record is kept of the questions and the order in which they are asked, and this allows one to follow the subject's procedure in solving the problem. The questions he asks give important clues to the data he deems important in reaching his goal and the steps he follows thereby. Since the diagnostic processes can be conceived as a special instance of problem solving behavior, the technique has been used by Tabor (1959) to study Rorschach interpretation and by Mohrbacher (1961) to study diagnosis of minimal intracranial pathology in children. The present study attempts to apply this technique to the study of processes involved in solving clinical problems and will show whether persons of different backgrounds do in fact solve problems in a different manner.

Clinical problems (or psychological problems), i.e., problems involving interpersonal relationships, were selected for study for a number of reasons. Since clinical problems have some familiarity to everyone, they are used as subject matter to allow the test to be administered to either

lay or professional persons. An aim of this research is to determine whether lay persons solve clinical problems in a different manner than professionally trained persons. Many people have claimed that the clinician is not a scientist but more of an artist. By this they have meant that no lawfulness exists in the procedure used by clinicians as a group; each uses his own unique approach. Particular attention will be paid to this variable while this research is being conducted (mainly by noting presence or lack of group homogeneity among clinicians).

There is also the question of whether persons belonging to different disciplines (e.g., social worker, psychologist, psychiatrist) proceed in a different manner. There has been much speculation on this matter, but very little work has been done to determine how these persons actually proceed in their attempts to understand a person and his problem. Almost all of the previous work has dealt only with the final result and not with how the worker reached that result. Even when the processes have been studied the research has not generally employed sound experimental conditions since most of the extraneous variables have not been controlled.

Thought processes are affected by many factors, and it is felt by this author that emotionally loaded problems may be affected by the emotional conflicts of the person trying to solve the problem. All persons are faced

with the task of handling problems dealing with interpersonal relationships. Emotional problems, if unrealistic and inappropriate, complicate one's attempts to reach goals set for himself or at least reach these goals in the most efficient manner. A major aim, therefore, of this research will be to determine whether the processes employed by those who are diagnosed as suffering from an emotional disturbance are different from those used by apparently undisturbed persons.

Another factor which might be expected to affect one's thought processes is his intelligence and, perhaps along with this, the amount of his education. It could be expected that the bright person would approach the task of solving a problem in a different manner than one less endowed intellectually. An attempt will be made in this study to analyze this hypothesis by administering the test developed for this research to bright and dull or poorly educated lay persons. There have been many speculations about how training and experience affect the ability of clinicians to evaluate or diagnose persons. Another major aim of this study will be an attempt to determine whether or not the highly trained and experienced clinician employs a different approach in solving the problem than the less trained and experienced clinician.

This latter aim is one that should be of particular interest to those concerned with the training of clinicians. Perhaps this study can locate those important differences that seem to be concomitant with training and experience. Should the technique prove valid for this, it would allow others to select those approaches to the problem that seem most productive. No longer would one have to be content merely to analyze the response, but he would be able in time to locate better, more efficient paths to the goal.

An attempt was also made to determine whether persons adhering to particular theoretical schools, e.g., Freudians, Adlerians, Rogerians, etc., differ from one another in their procedure. However results were inconclusive because it proved impossible to obtain a sufficiently large sample of each group. It is felt by this author that this technique will be particularly applicable in this area, much more so than the techniques that have been employed previously.

It should be born in mind that this study is not concerned with the validity, or lack of it, of clinical judgment; only the manner in which that judgment was arrived at will be considered. Focusing on the validity would cause this study, like so many others, to deal only with the end results.

Subjects taking part in this research will not be requested to make a diagnosis, but instead will be asked to write a few sentences describing

what the clinical problem and its causes appear to be. The author feels that if a diagnosis is made the problem of nomenclature enters in, and a less specific solution to the problem is allowed. For example, if a subject is allowed to make a diagnosis of "normal or essentially normal," he has not to any extent differentiated between the millions of persons who could be classed under that term. A dynamic understanding of the cases presented to the subjects is what is desired, and the aim of the study is to determine if the technique used here will allow analysis of the thought processes to see whether group patterns do appear.

Each subject who takes part in this study has a background both different and similar in some respects from the others. No one enters this or any other testing situation with a tabula rosa. This approach, in a manner of speaking, allows the subject to select his own stimuli. He may select any or all of the 130 cards provided and can interpret each card in any manner he chooses. While he attempts to solve the problem or understand the people depicted in each case, he brings to bear the sum total of his life experiences. Since a great deal of freedom is given to each worker to interpret the data as he wishes, each person might be expected to reflect his particular life experiences and biases by the manner in which he proceeds through the test. Thus the test may also become a "projective"

instrument--one that allows a subject to ascribe a trait to someone else that is unacceptable to himself. It might be regarded as false perception, and attention will be paid to such behavior when the results are analyzed.

Particular attention was focused on group patterns but not at the expense of failing to note how particular individuals solve the problems. The author feels that the technique used in this study will permit direct analysis of thought processes for either groups or individuals. Should this thesis prove correct, the value of this technique in understanding how people solve clinical problems will have been demonstrated.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

Historically, psychologists have studied and interpreted behavior by analyses of certain aspects of responses following a stimulus which may or may not have been systematically controlled. From this analysis of the responses inferences are made of that which lies between the stimulus and the response and which has often been designated as "O" for organism. While it is quite true that this method allows one to vary the experimental conditions, e.g., the stimulus and consequent results produced in the response, it does not permit direct observation of the processes intervening between the two.

As Rimoldi (1961) points out "the study of the responses is insufficient to establish the truth of inferences that were made about the processes."

However, it is particularly true that in the area of problem solving behavior nearly all of the research has dealt only with the response to a stimulus. Processes are not, for the most part, dealt with even indirectly.

Thought Processes Involved in Clinical Diagnosis

Nearly all of the previous research dealing with clinical diagnosis and evaluation has been concerned with only an analysis of clinical judgment. Much of this work has been done on what might be termed consensual validation or agreement between various workers.

Typical of this kind of research or survey is the work done by Taft (1955). He summarized the results of 81 studies which were done on the ability to "judge" people accurately and found wide discrepancies were reported between the various judges. He concluded that these discrepancies were due to various factors among which he listed differences in the experience and background of the judges and different criteria of what constitutes an adequate judgment. While these may be important findings, it is obvious that they deal only with the final results and not even secondarily with the thought processes involved in the judgments.

A review of the literature reveals a number of other studies of this same type. Ash (1949) found an agreement of 45.7 per cent between independent diagnoses of 52 adult patients by three psychiatrists when major diagnostic categories were used. However, when specific diagnostic categories were used agreement dropped to only 20 per cent. Schmidt and Fonda (1956) also found low agreement between psychiatric diagnoses when

specific diagnostic categories were used. Their study dealt with the diagnosis of 426 state hospital patients by eight psychiatrists. Mehlman (1952) studied the diagnosis of 4,026 patients by 40 psychiatrists and concluded that a number of psychiatrists tended to use certain diagnostic categories more frequently than others. The main diagnostic categories used were organic versus psychogenic and manic depressive versus schizophrenic disorders. Wallenga (1956) was able to identify one variable, namely diagnosis by different medical facilities, which apparently causes variability of psychiatric diagnosis. This last study is particularly pertinent with the current research because the method used here allows for direct comparison of procedures used by different workers or groups of workers.

Other studies which were conducted along similar lines show similar results. Hunt, Witson and Hunt (1953) found that two teams of psychiatrists agreed only 32.6 per cent of the time on the specific clinical diagnosis of 794 men being examined for military duty. Agreement was 93.7 per cent when the only decision made was one of suitability. Similar results were found by Hunt and Arnoff (1956) with psychologists when they were asked to rank a set of Wechsler-Bellevue items for schizophrenic content at three and eighteen-month intervals.

These are a sample of the studies which deal with the validity and/or reliability of clinical diagnosis. They are not presented here because the method of research is essentially the same in each case; a correlation is computed between several groups of diagnoses (often by different diagnosticians) or between a diagnosis and some outside criterion. Many diagnostic instruments are validated in this manner, but it is quite obvious that the thought processes involved in these diagnoses are not directly analyzed. Only the end result is analyzed. Much of the research that has been presented indicates that clinical diagnosis leaves something to be desired. It would seem, therefore, that some research should be done which might detect similarities and differences in the procedures of different workers. It was this feeling that led to the current work, but the author wishes to review a few more of the classical studies that have been done in the area of diagnosis and evaluation.

A number of studies have been done on the predictive ability of various diagnosticians, but, again, these studies which emphasized the end result or response are radically different from the current one. Some of them are reviewed here because it serves to stress the point that direct analysis of thought processes has seldom been attempted.

Polansky (1941) asked a group of social workers to make certain behavioral predictions about their clients after they had read the client's case history. The results of this study indicated no significant relationship between the degree of knowledge about a patient and the accuracy of the behavioral predictions. Nothing in this study gave any indication of how the predictions were made, i.e., what specific datum led to a particular prediction. Phelan (1960) found that psychologists were unable to match multiple test data with interview data with any degree of certitude. Once again no work was carried out on how the matching was done. The same type of study was done by Harway (1959) with psychiatrists. Nine psychiatrists were asked to complete the Edwards Personal Preference Scale (EPPS) as they felt their patients would complete it. Then the patients were given the EPPS to complete and it was found that only one correlation between a patient's EPPS responses and his therapist's prediction of his responses was significant. Again, no work was done to try to identify the processes that would account for these predictions.

Attempts have been made to determine what variables may account for different diagnoses or judgments about some patient. Daily (1952) conducted a study that is fairly typical of the common approach to this problem. Daily wanted to determine the role of "premature conclusions" in

hampering further understanding about a person. He defined "premature conclusion" as "any statement made by an observer before he has observed the optimal amount of the person's behavior" (Daily, 1952, p. 113). In actual practice in this study the "optimal amount of the person's behavior" turned out to be the person's autobiography. One group of subjects was asked to make predictions about the person before they read any of the autobiography. Predictions consisted of attempts to fill out the Guilford-Martin Inventory (GAMIN) as they felt the person in question would do. The other group of subjects was requested to read the autobiography before they filled out the GAMIN inventory. It was hypothesized that the first group would tend to "defend" their predictions and would, therefore, be hindered in their understanding of the person. The person being studied had actually filled out the GAMIN inventory and the hypothesis was supported by the data.

Several other studies have been done which have shown that "set" or "bias" do affect clinical judgments. Burke and Fiske (1957) attempted to evaluate the role of four psychologists' stereotypes of the "typical anxiety neurotic" on predictions they made of Q sorts made by four male patients who had previously been diagnosed as anxiety neurotics. The four psychologists were trainees from a veteran's administration clinic and had made Q sorts both for themselves and as they felt the "typical anxiety neurotic"

would sort the items. They were then asked to re-sort the items after receiving various amounts of information about the patients. It was found that greater amounts of information did not significantly improve the predictive ability of the psychologists, although the personal interview did help to some extent.

From the conclusions reached by these studies it would seem very likely that bias enters into misevaluation and misdiagnosis. This makes it even more important to try to determine where and how the bias works. Yet again, only the final result was dealt with and little information was gained as to how the diagnostician works.

Sines (1959) tried to determine how various types of data affected the accuracy of diagnosis of 30 male veteran's administration outpatients. The subjects were five veteran's administration clinical psychology trainees. They were given four types of data: biographical, MMPI, Rorschach, and personal interview. Validity coefficients were computed between Q sorts after exposure to each type of data and the criterion Q sorts which was obtained from the patient's therapist. While the correlations became higher with more data, only the end result or Q sorts were studied. No attempts were made to determine how these Q sorts resulted.

Some studies and articles have attempted to deal with the problem of how different therapists or diagnosticians work. Strupp (1957) performed a multidimensional comparison of therapist activity in client-centered and analytic therapy. His multidimensional comparison consisted of ratings done along two sets of categories and three scales of intensity. Two judges rated according to the degree of certain factors either found or not found in the two types of therapy sessions studied. His conclusions indicated differences; in particular, the client-centered therapist was primarily reflective while the analyst was more interpretative, explorative and used more passive acceptance.

Again, in another study Strupp (1955) studied the effect of professional affiliation and experience upon psychotheropeutic technique. A series of 27 short paragraphs of statements by patients was culled from published therapeutic interviews and typed on individual cards. Therapists were then presented with the cards and limited background data and asked what response, if any, they would make to the hypothetical patient. "Silent" responses were also permitted. The therapists included 25 psychiatrists, nine social workers and seven psychologists, and all claimed allegiance to psychoanalytical or neo-Freudian principles. Experienced therapists in this group were those with at least five or more years of experience. Results

indicated only one really significant difference due to professional orientation; namely, social workers tended to use a greater amount of reassurance than psychiatrists and psychologists. Other differences of which only three were significant were attributable to experience and indicated that the inexperienced therapist explores more, uses more passive rejection, and interprets less than the experienced therapist.

It is perhaps worthwhile to mention several more studies done in this area because the methods employed in them are still different from the methods in those previously mentioned.

Fiedler (1952) used a somewhat different method in order to study certain variables involved in the therapy relationship. He recorded interviews electrically by four analytical, four non-directive and two Adlerian therapists. Half of each group were designated as experts on the basis of national reputation and the other half as non-experts. The interviews were rated by four judges in terms of 75 statements describing therapeutic relationships in accordance with the Q-sort technique. It was found that experts were more alike in the type of relationship they established than were members of the same school.

Wolf (1956) held guided interviews with 43 psychotherapists of various schools in an attempt to answer questions concerning common terminology,

main areas of criticism of various therapeutic systems, basic controversies concerning different techniques, and personality factors involved in techniques. He found considerable divergence of opinion, but the study sheds little light on how any of the therapists actually work.

The studies reported to this point represent the typical approach used by psychologists to date to study similarities and differences between various groups or to determine accuracy of diagnosis or judgments. They have little in common with the present study for two main reasons. First of all, most of them involve validation or attempt to deal with it, and validation is not a problem dealt with in this study. Secondly, they all deal primarily with the end result and not with the thought processes that lead or fail to lead to a goal.

Only two studies have been done which allow direct examination of the clinician's thought processes, and both use the Rimoldi (1955) technique which is used in the present study. Tabor (1959) in a highly original study used this technique to examine the processes involved in Rorschach interpretation. Subjects were 30 Rorschach experts who were requested to make three diagnoses on the basis of Rorschach protocols. Tabor was able to study process directly and found that experts do indeed proceed along highly similar lines; a pattern analysis indicating Indices of Agreement of .73, .74

and .74 in the three cases. A high degree of self-consistency for each analyst was found also, W = .74 (Kendall's coefficient of concordance).

Mohrbacher (1961) conducted the second study and analyzed the processes of three disciplines (psychiatrists, psychologists and social workers) when diagnosing "minimal intracranial pathology" in children. Each subject was asked to make a diagnosis in terms of the categories listed in the APA Diagnostic Manual (1952). While there were some strong areas of agreement, Mohrbacher found that the members of the different disciplines proceeded in very different fashion. Often they may have selected the same questions but in different order. This study strongly indicates that while a number of persons may solve a problem, i.e., make a diagnosis, their underlying processes may be very different.

Thought Processes Involved in Problem Solving Behavior

There have been two main approaches used to the problem of understanding underlying processes involved in problem solving. The first approach starts with the end result and then makes inferences about the throught processes. In this approach one might trace the stages to the solution of the problem after it has been solved. The second method aims more directly at evaluating the thought process itself.

Binet (1905) used the first approach in an attempt to determine how his daughters had solved intellectual tasks. After they had solved the problem he asked them to explain how they had achieved the solution.

Polanyi (1957) used an approach similar to that of Binet's, only he merely classified stages of problem solving after watching and talking to persons solving problems. He noted a stage of perplexity followed by a second stage of doing something which then dispels this perplexity.

A third study is strikingly similar to Binet's approach. Szuman and Dunin (1955) presented 20 riddles to 184 children between the ages of four to seven. All answers were accepted and then the children were asked to explain how they got the answer. The most unique factor about this study is the accepting of all answers. From an approach such as this, error can to some extent be analyzed. Wertheimer (1945) also used an approach which demonstrated the retrospective approach. Similar to the approach of Binet, after a problem is solved the thought processes that led to the solution are reported.

Several experiments that were carefully controlled attempted to define the processes by analyzing the end result. This approach is illustrated by Heidbreder (1928) and by Maier (1936) in studies they have conducted. Puzzle-type problems were generally employed and were so

done that success or failure was easily determined. Records of overt behavior and offered solutions were kept and, from these, attempts were made to trace the underlying processes that led to the solution or failure.

Piaget (1928) attempted to understand the nature of the reasoning from the language of the child, but probability of error is very great with this approach.

Titchener (1909) conducted several classic studies using an introspective approach by requesting that his subjects report their thoughts and feelings while performing a task. Bloom and Broder (1950) used a similar approach but used multiple-choice type problems.

Review of the literature indicates that while many validation and reliability studies have been conducted, little has been done to analyze how solutions or responses were achieved. What has been done relies mainly upon retrospective reconstruction starting once again from the end result. Bloom and Broder (1950) point out a number of difficulties and it is sufficient to mention but a few to show the problems encountered with this method. They point out that it is difficult to remember all the steps in the thought processes, and it is especially difficult to recall sequence. Processes that lead to errors or "dead ends" are usually ignored when trying to recall the steps followed.

When attempts have been made to deal directly with processes, it has not been possible, with the exception of the studies using the Rimoldi technique, to follow along step by step the solution of the problem. The use of this technique permits a new approach to this perplexing problem of what goes on between the stimulus and the response.

Development of the Rimoldi Technique

The technique adapted to the present study was originally developed by Rimoldi (1955) and used to evaluate medical diagnostic ability (Rimoldi, 1956; Rimoldi, 1958). It has been used quite extensively to determine its applicability in differentiating diagnostic ability at various levels of medical education. The technique was found to be highly successful. It was found that expert medical diagnosticians selected few items of information, all of which had the highest rate of selection by the group. Juniors and seniors in medical school often chose information not held to be of much value by the group.

More refined research by Rimoldi (1958) indicated some highly significant differences in the utility value (indices of item popularity) that juniors and seniors ascribed to particular items of diagnostic information. It was found that senior students proceeded more critically in their

diagnosis, undoubtedly because they possessed greater medical knowledge than juniors.

One further development by Rimoldi and Haley (1961) has been incorporated into the present study; this is the use of order analysis which allows the sequence of processes to be followed more accurately and compared with the sequence of other persons or groups. It is felt that the Rimoldi technique will allow analysis of something hitherto impossible to analyze directly, namely the thought processes involved in solving clinical problems. Should this technique prove as valid for this use as it has for Rorschach interpretation and diagnosis of brain injury, more light will be shed on how the clinician and the lay person go about solving problems dealing with the understanding of human interaction and conflict.

CHAPTER III

DESCRIPTION OF SAMPLE AND METHODOLOGY

At the present time little is known about the thought processes involved in solving clinical problems. Those in charge of training the diagnostician would assume that his procedure will be affected by his training and perhaps by his particular theoretical orientation. How experience might influence the above mentioned factors would also be open to question. A number of possibilities come to mind. The novice may use an approach widely variant from case to case or he may be overly rigid in adhering to a sequence prescribed in some textbook. A further question would be whether those who have had a certain amount of experience proceed in a similar manner and appear different from the untrained subject.

A variety of subjects had to be used in an attempt to answer these and other questions. Selecting and enlisting subjects proved to be a most formidable task. The instrument designed for this study was sufficiently difficult so that it required from two to four hours to complete. It was necessary to make the test that difficult because otherwise it would not have

been challenging to the expert. Also data had to be available for those of different orientation and backgrounds. The subject, therefore, had a great deal of data to familiarize himself with before attempting to solve one of the four problems. Psychologists, psychiatrists and social workers are busy people these days and enrolling them for this study proved difficult.

Various criteria were used for all those who took part in this study. Criteria for trained psychologists were

1. attainment of a Ph. D in psychology and
2. three to five years' experience with diagnosis of clinical cases where other staff members have included, at some time, psychiatrists and social workers.

Criteria for untrained psychologists used in this study were

1. attainment of a master's degree in psychology and
2. two years' experience in diagnostic work.

It was difficult to enlist psychologists for participation in this study, but all told 25 were used, six of whom met the criteria for trained psychologists and the same number for untrained psychologists. The other 13 did not fit either category.

The criteria for trained social workers who took part in this study were

1. attainment of a master's degree in the field of social work,

2. currently working as a diagnostician, and

3. at least one year's work in a child guidance clinic or similar clinical setting.

The untrained workers met the second and third criteria above but did not have a master's degree. Forty social workers participated in this study and ten fell into each of the two groups of trained and untrained psychologists (20 not meeting the criteria for either group).

Membership in the "uneducated" group required the following

1. no more than a grade school education,

2. grades of average or less in school, and

3. currently working at that level.

Where intelligence quotients were available, they could be no higher than 90 or lower than 70. No one was selected in this group if there was any history of mental illness.

Those who comprised the "bright" group included in this study

1. possessed at least a master's degree in a field unrelated to psychology,

2. were currently working at that educational level, and

3. had no history of mental illness.

Where intelligence quotients were available, they were required to be no less than 125.

Finally, a group of neurotic persons were used in this study and criteria for this group were

1. diagnosis of a neurotic disorder by either a psychologist or psychiatrist but no requirement of institutionalization,

2. possession of at least average intelligence as evidenced by either an intelligence test or securement of a high school degree, and

3. currently working up to that occupational level.

A total of ten subjects qualified as bright, ten as neurotic, and ten as uneducated. These 30, therefore, were administered the test along with the 40 social workers and 25 psychologists.

The basic materials used in this study consisted of three clinical cases, two of which were seen by a complete diagnostic team, i.e., psychologist, psychiatrist, and social worker. These two cases were staffed and evaluated quite completely. The three cases with the basic information were:

Case I. A couple with marital problems, husband 39 years old, wife 37 years old. Chief complaints: persistent inability to talk over problems, sexual incompatibility, and major disagreements as to how to raise the two daughters ages 12 and 14. The wife wants more freedom and the husband desires strictness.

Case II. A boy, age 12, with school problems. Seen only by a psychologist and social worker and possessing an intelligence quotient within the superior range, but doing only average work in school. This boy was actually quite normal but unacculturated as he had recently arrived from Germany at the time seen by the workers.

Case III. A girl, age 13, with bad dreams primarily concerned with violent arguments she has witnessed. On one occasion she saw her mother threaten her father with a knife and the bad dreams seem to have started shortly thereafter.

Among other things, these three cases were selected because there was general agreement among all workers as to etiology and because the same problems do not occur in all three.

In order to determine the type of data demanded by various workers, best order of presentation of cases, and to make sure that there were no ambiguities, a pilot study was done with 63 subjects. Only 28 were professional persons.

On the basis of the pilot study, 130 questions were selected for each case. They were made as nearly alike from one case to the next as possible so that direct comparisons could be made. Evidence from this study indicated that neither position of the card (e.g. first or last) nor order of presentation of cases affected the subject's performance. This

factor, therefore, was uncontrolled in the study and nearly everyone started with Case I following with II and III.

Questions were worded so that everyone could understand them, even those with the least education. No technical terms were used, and only two persons (both of whom misread questions) who took the test raised any questions.

On the basis of the pilot study, questions were selected which covered the following areas: religion, financial, social, personal, sexual, background to the problem, childhood and personality traits, children (or parents in Case II) and symptoms.

All of the data were then transferred to 3 x 5 cards, with a question on the front side and the answer plus a card number on the back. Appendix I illustrates the manner in which a question and the answer were presented on the cards. No datum that was opinionated was placed on the cards unless it was so stated; even then the evidence upon which some opinion was based was given.

These cards were then placed in pockets in a slotted 24 x 29 folder in such a manner that only the questions on each card were visible.

Then all subjects were told to open the test folders and to look at the manner in which the cards were arranged. They were told that after

selecting the "Problem Card," the card which told the type of problem to be solved, they were to read all of the questions and select only those cards which they feel are necessary to write a short statement of what the problem is and any causes of it. The detailed instructions are given in Appendix II. It can be seen from these instructions that workers took the test anonymously but gave their profession, experience, schooling, and any theoretical orientation they had. Subjects were told that they could "think aloud" if they wishes, or write comments after any questions. Few did this, however.

Statistical procedures will be elaborated on along with the analysis of the data in the next chapter. This is done for sake of clarity since most of the techniques are new and can be explained best along with the analysis of the data. The qualitative aspects of interpretation will be discussed directly after the important quantitative data.

CHAPTER IV

ANALYSIS OF DATA AND RESULTS

The amount of information needed to evaluate each case varied considerably from one subject to another. This was particularly true if the "neurotic" subjects are taken into consideration. Some of the workers felt they knew the cases well after selecting only a few cards, while others complained that they could not find what they wanted even after selection of nearly 80 cards. One worker selected only six cards in solving Case II, while two workers from the group of neurotics selected over 100 cards.

However, as can be seen from Table 1, groups cannot be differentiated on the basis of mean number of cards selected. There is some difference in the range, but in all cases this was due to just one individual, and there was very little variation around the means of the different groups. For purposes of this comparison, neurotics were not considered as a group but will be dealt with later on a more individual basis.

Particular workers remained quite consistent in the amount of information they required for each of the three cases (Pearson r for all

Table 1

Mean Number and Range of Cards Selected

	Case I		Case II		Case III	
	Mean	Range	Mean	Range	Mean	Range
Psychologists	17[a]	14-60	18	12-52	17	13-48
Social Workers	17	8-41	18	13-77	18	13-56
Bright	16	10-37	18	6-41	17	13-22
Uneducated	17	10-34	18	11-23	18	14-26

[a] Means rounded off to nearest whole numbers.

subjects, tests I and II .92, tests I and III .86). For example, one worker accounted for the two highest number of card selections for psychologists on Cases I and II and was only two cards short of selecting the most number on Case III also. The same was found to be true for the other groups and, for this reason, the number of cards selected was not deemed an important variable for this study.

Comparison of card popularity or utility index (Rimoldi, 1958) indicated that while three groups are far from identical they are at least quite similar. The most popular cards for the group of uneducated persons were radically different from those of the other three groups. The five most popular cards were the same in the other three groups (social workers, psychologists, and bright persons) for all three cases, and even after the first five cards there were no striking differences.

Most all of the professional workers involved in this study used the same cards, and this was true to a lesser extent with the subjects comprising the bright group. It was felt for that reason that utility index was not appropriate for this study. To merely determine that a subject selected certain cards tells us the information he used, but fails to show the steps he followed toward solution of the problem. Selecting a particular

card first might involve an entirely different set of thought processes than selecting the same card last.

In order to follow more closely the steps involved in problem solving behavior, the Rimoldi-Haley Technique (Rimoldi and Haley, 1961) was used. This technique takes into consideration not only the card selected but the order in which it was selected as well. The Rimoldi-Haley Technique allows the tabulation of a utility index for each cell. A cell represents both the card selected and the order in which it was selected. The utility index employed by Rimoldi in many of his studies for the study of medical diagnosis is defined as the ratio between the number of times an item was selected and the number of subjects in the group. In the Rimoldi-Haley Technique the cell utility index is the ratio between the number of times a card was selected in a particular order and the number of subjects selecting cards in that order. This technique is called "order analysis" and is based on the proportion of times any card was selected in any particular position. One example clearly shows the difference between performance measured by utility index and by "order analysis" (Rimoldi-Haley Technique). Figure 1 indicates the performance of two subjects according to accumulative index. Subject 19 is an untrained social worker, while subject 22 is a highly trained social worker. The workers' performances

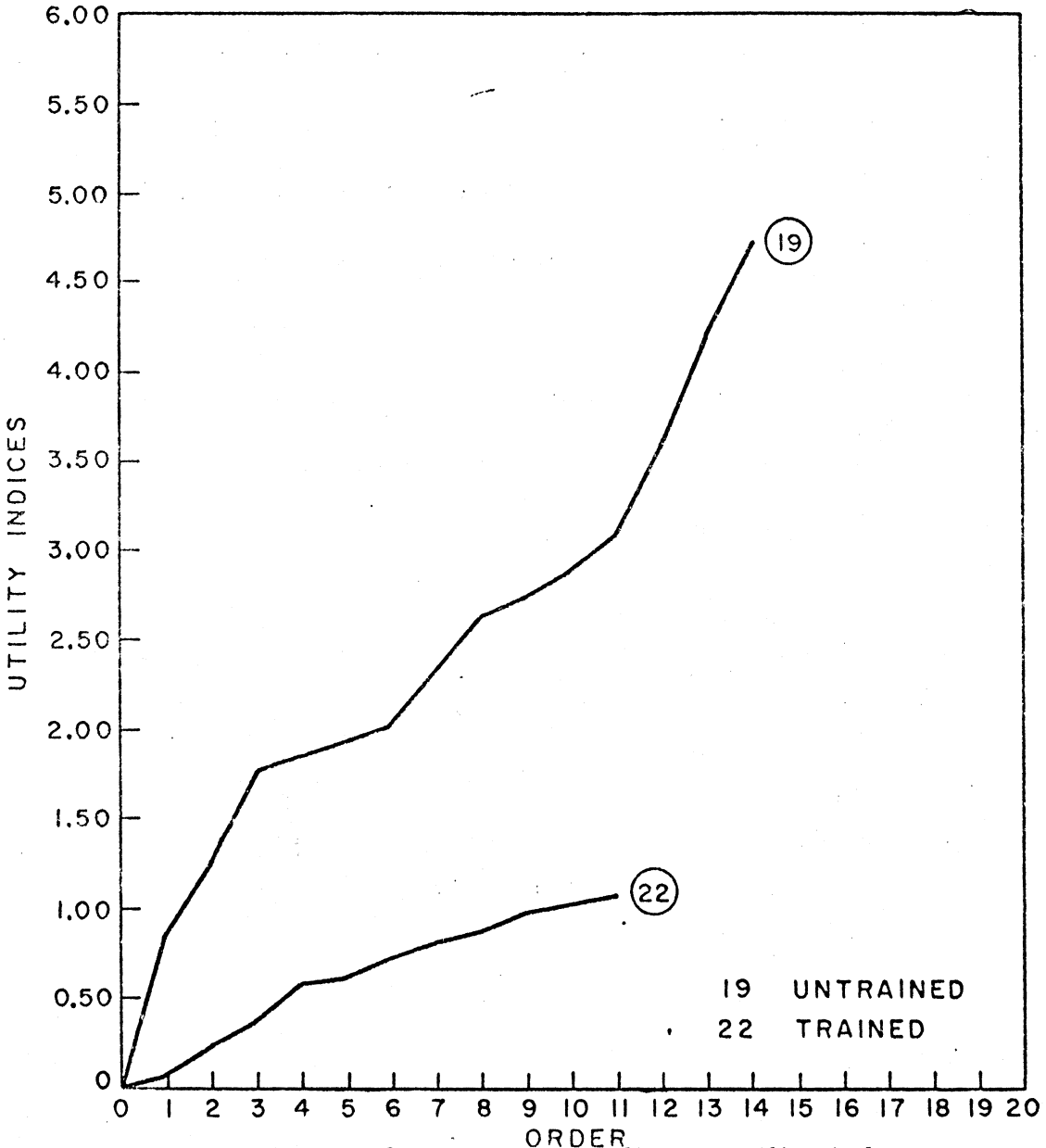


Fig. 1. Performance according to utility index

are plotted again in Figure 2, but according to the value of each card considering order as well as card popularity, which adds a further dimension to the characterization of a behavior sequence.

This illustration shows very clearly that it is important to know not only what a person does, but when he does it. There comes a moment when information is highly useful and a moment later it may have little value. The sequence of gathering information, therefore, is vital.

Using this method of order analysis, the first attempt to validate the Rimoldi technique was made by trying to discriminate between trained and untrained social workers. Figures 3, 4 and 5 show the most representative curves of the trained and untrained workers on the three cases. For each group the "highest" and the "lowest" were selected as well as those who best described the group, i.e., the middle or most central curve and those around that point. The terms "highest" and "lowest" refer to the slope of a line and do not represent an evaluation. Since the aim of this study was to discriminate (e.g., trained versus untrained, psychologists versus social workers), evaluation is beyond the scope of this research.

While there are no established methods for evaluating the significance of the differences presented in the three figures, it can nevertheless be seen that the method discriminated the trained worker from the untrained worker

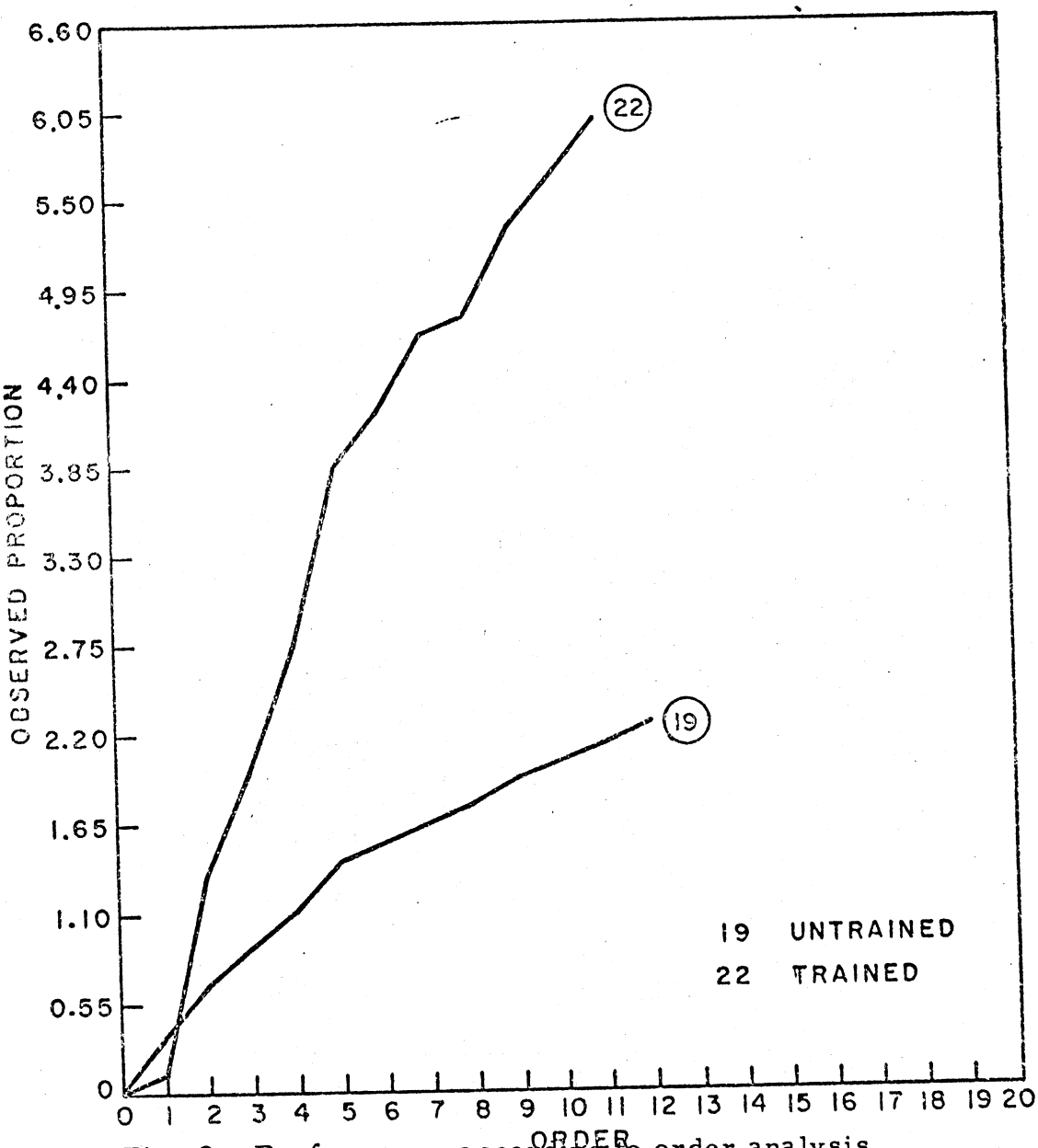


Fig. 2. Performance according to order analysis

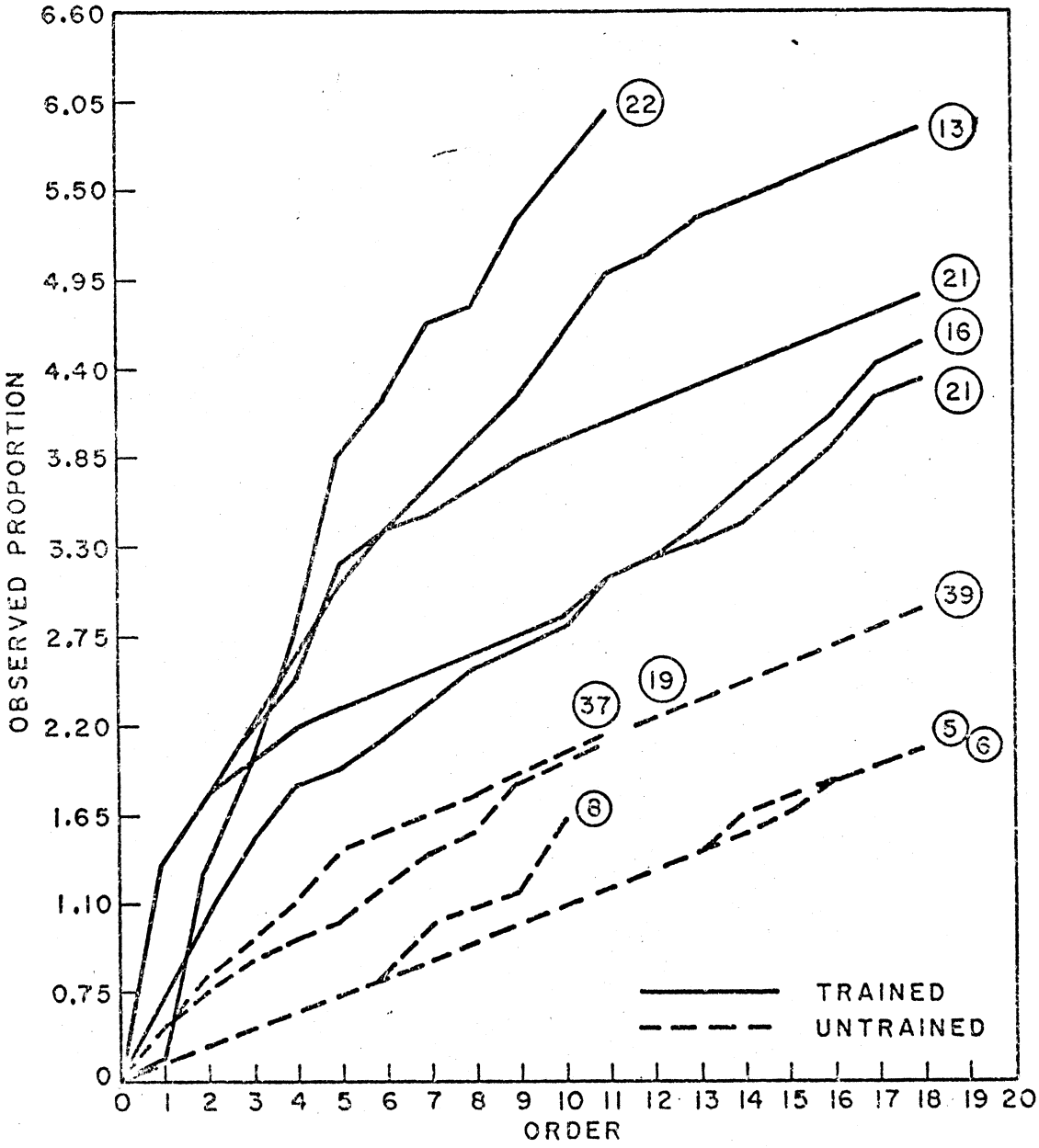


Fig. 3. Performances of social workers: Case I

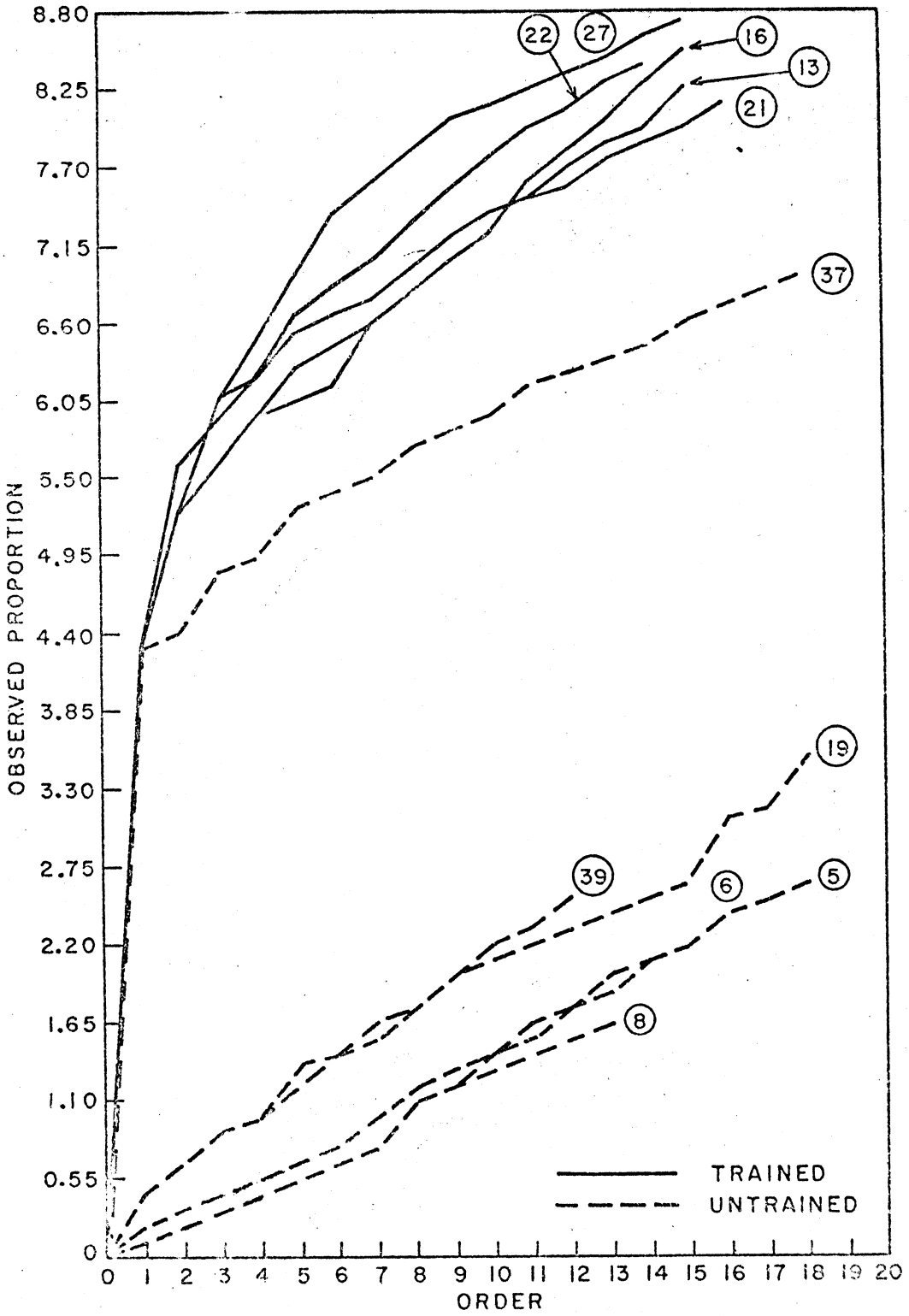


Fig. 4. Performances of social workers: Case II

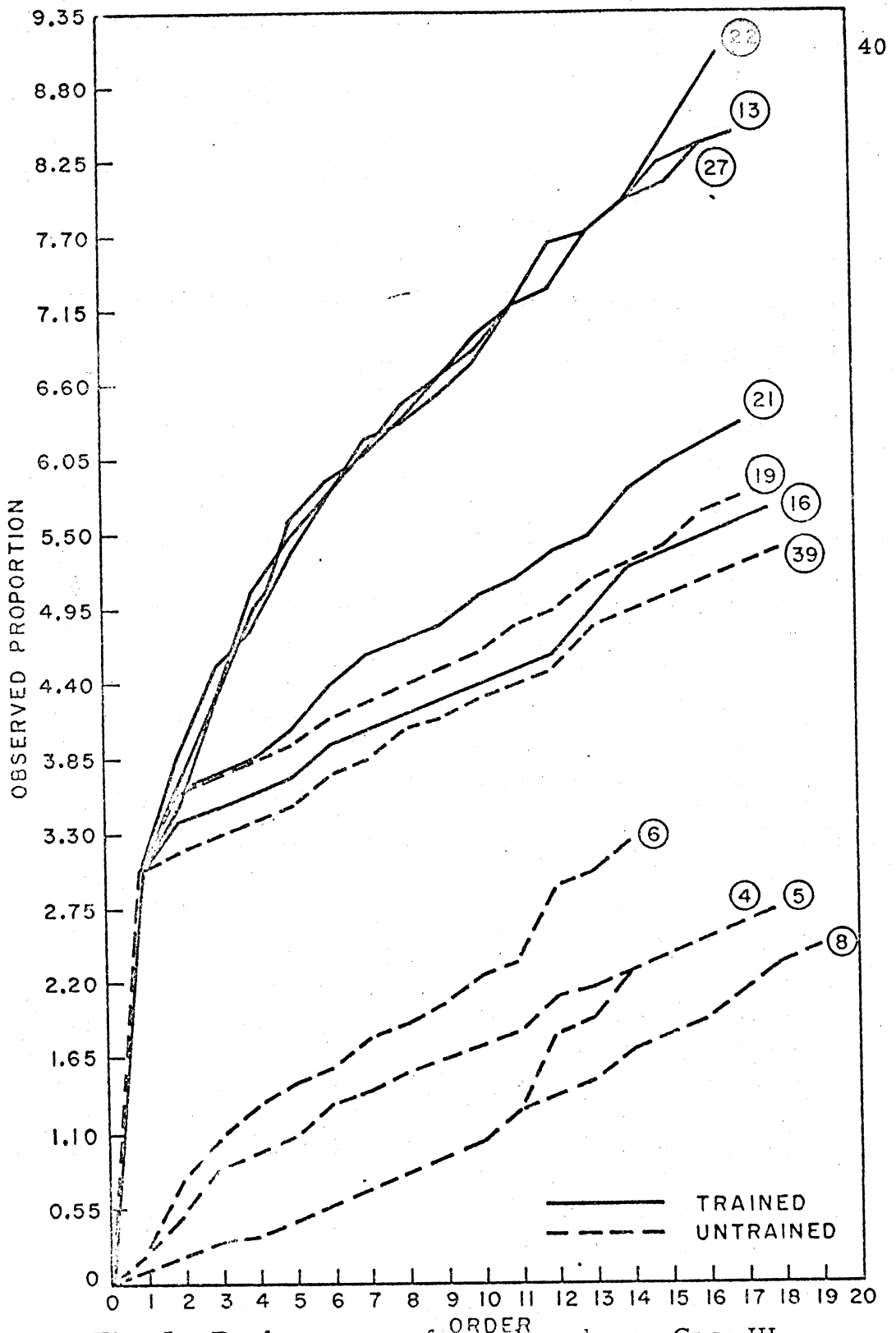


Fig. 5. Performances of social workers: Case III

in all but one case. (While it is impossible to state the effect of the unclassified S's it is nevertheless a fact that it was possible to discriminate trained from untrained workers.) The curve of subject 19 in Case III (Figure 5) is slightly above that for subject 16. Otherwise the groups are separated. It seemed that both groups selected approximately the same cards, and it appears that it was mainly order, therefore, that allowed the groups to be separated as far as performance.

An attempt was made to discriminate, in the same manner, between trained and untrained psychologists. Figures 6, 7 and 8 show the performance of these two groups on the three cases. The results are similar to those for the social workers; again in this case there is one overlapping of the two groups. The lines plotting the performances of the trained psychologists are in all cases but one above those plotting the performances of the untrained psychologists.

It is interesting to note that the performance of the untrained workers, whether they are psychologists or social workers, could not have been differentiated from trained workers by card selection alone. Examination of card selection reveals that the fifteen most popular cards appear to be selected almost equally by both groups. However, certain features characterized the performance of trained professional workers. They

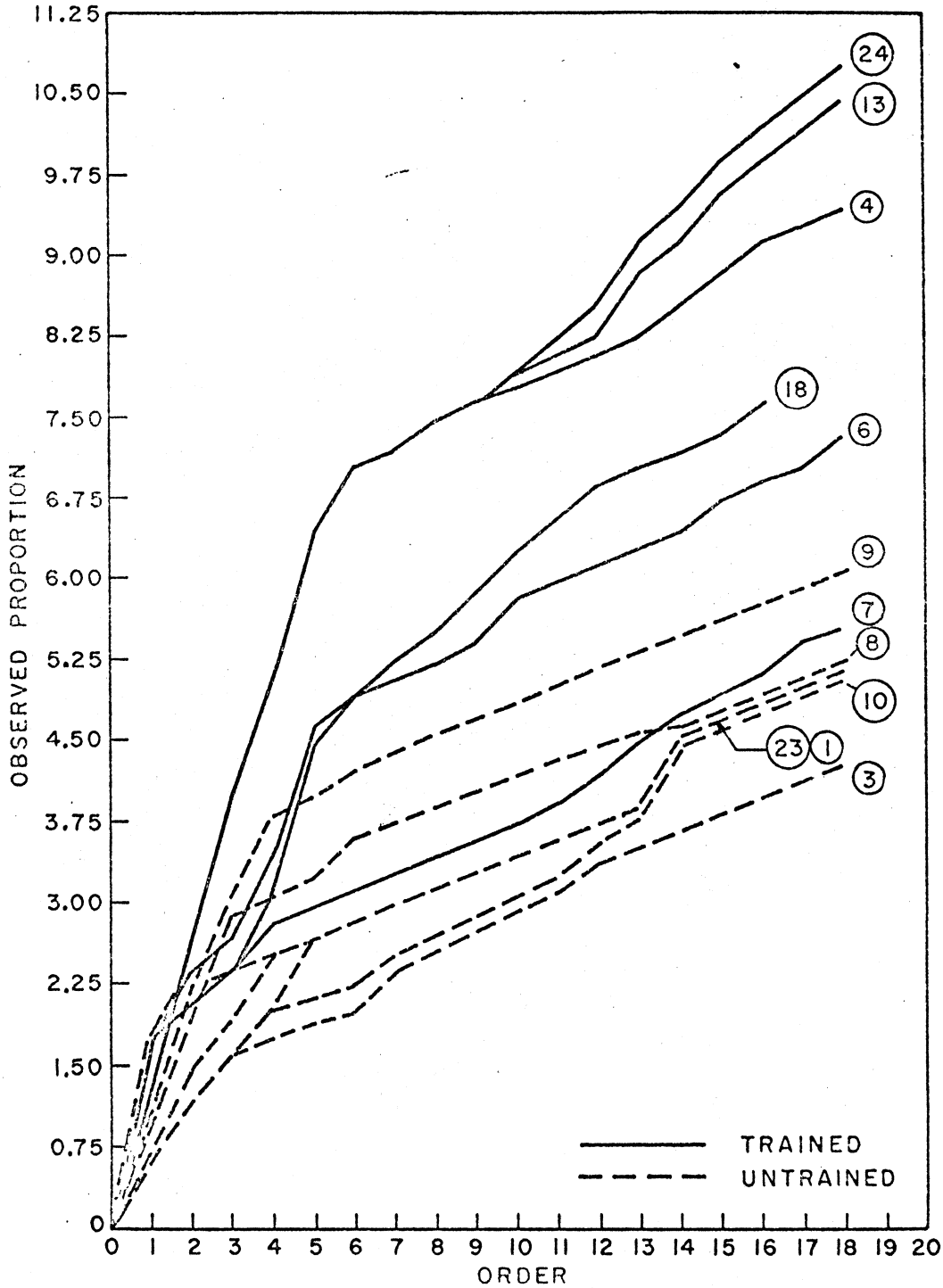


Fig. 6. Performances of psychologists: Case I

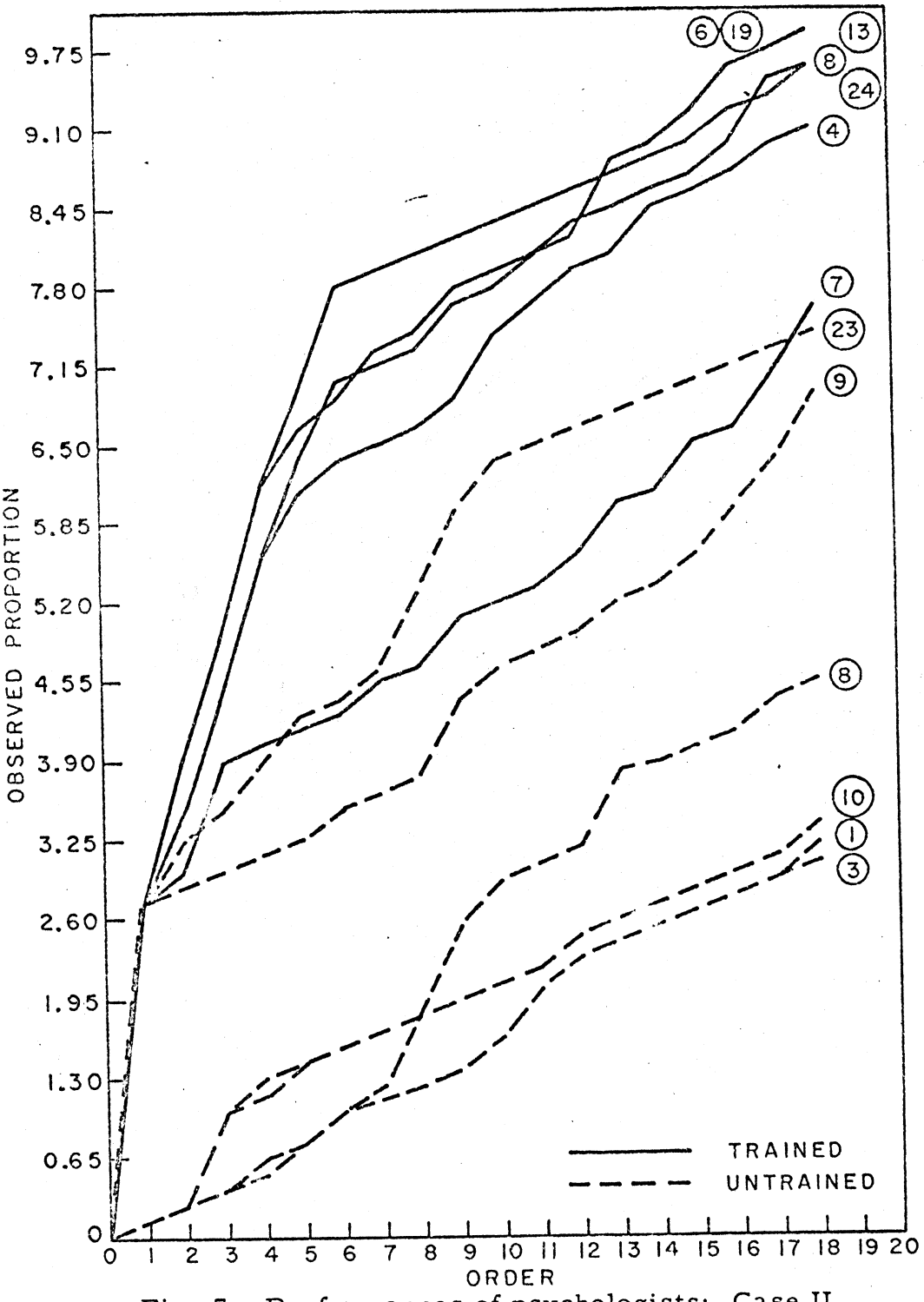


Fig. 7. Performances of psychologists: Case II

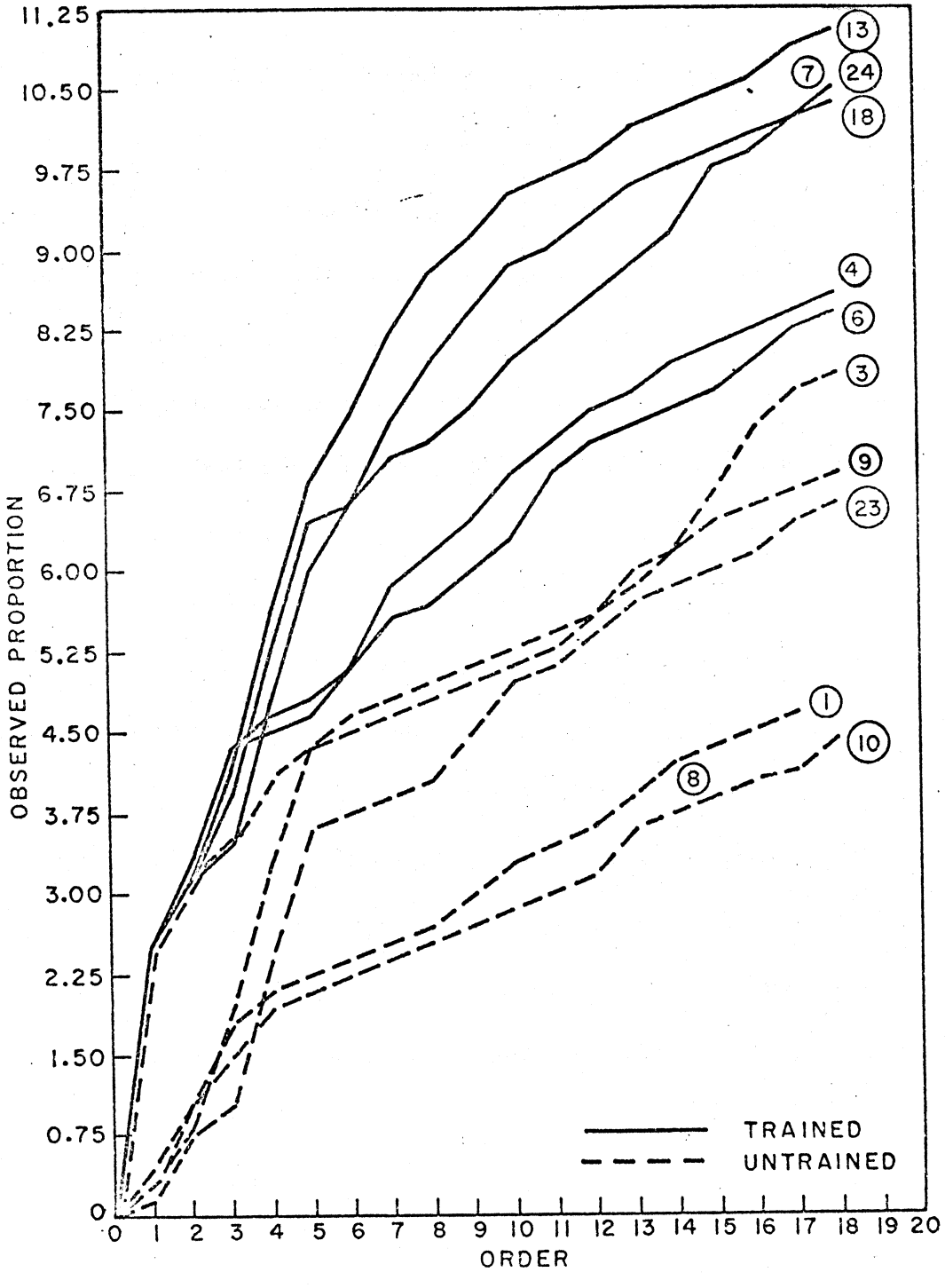


Fig. 8. Performances of psychologists: Case III

tended to select information first which gave personal data (such as age, intelligence, length of time married, etc.), then data about symptomology, and finally collect data about the childhood of the person under investigation. The untrained workers started with the symptomology, went to the area of childhood, and concluded with personal data. This approach, it appeared, caused more "shooting in the dark" than the previous one.

The attempt to discriminate between the four groups dealt with in this research was the final quantitative problem tackled in this research. The worker whose curve fell at the middle of his group was plotted for all three cases and is shown in Figures 9, 10 and 11. The middle curve (i.e. that curve falling between the other curves) was used because of the dispersion of several of the groups. Once again it can be observed that the Rimoldi technique has allowed the groups to be separated, and one can describe certain basic differences between them, i.e., homogeneity of cards and order. It can be observed that the curve representing the psychologists is the highest. This means that group was more homogeneous than were any of the other three groups. This homogeneity represents order as well as card selection.

Behind the curve for the psychologist are the curves for the social worker, bright subject, and uneducated subject in that order. The order

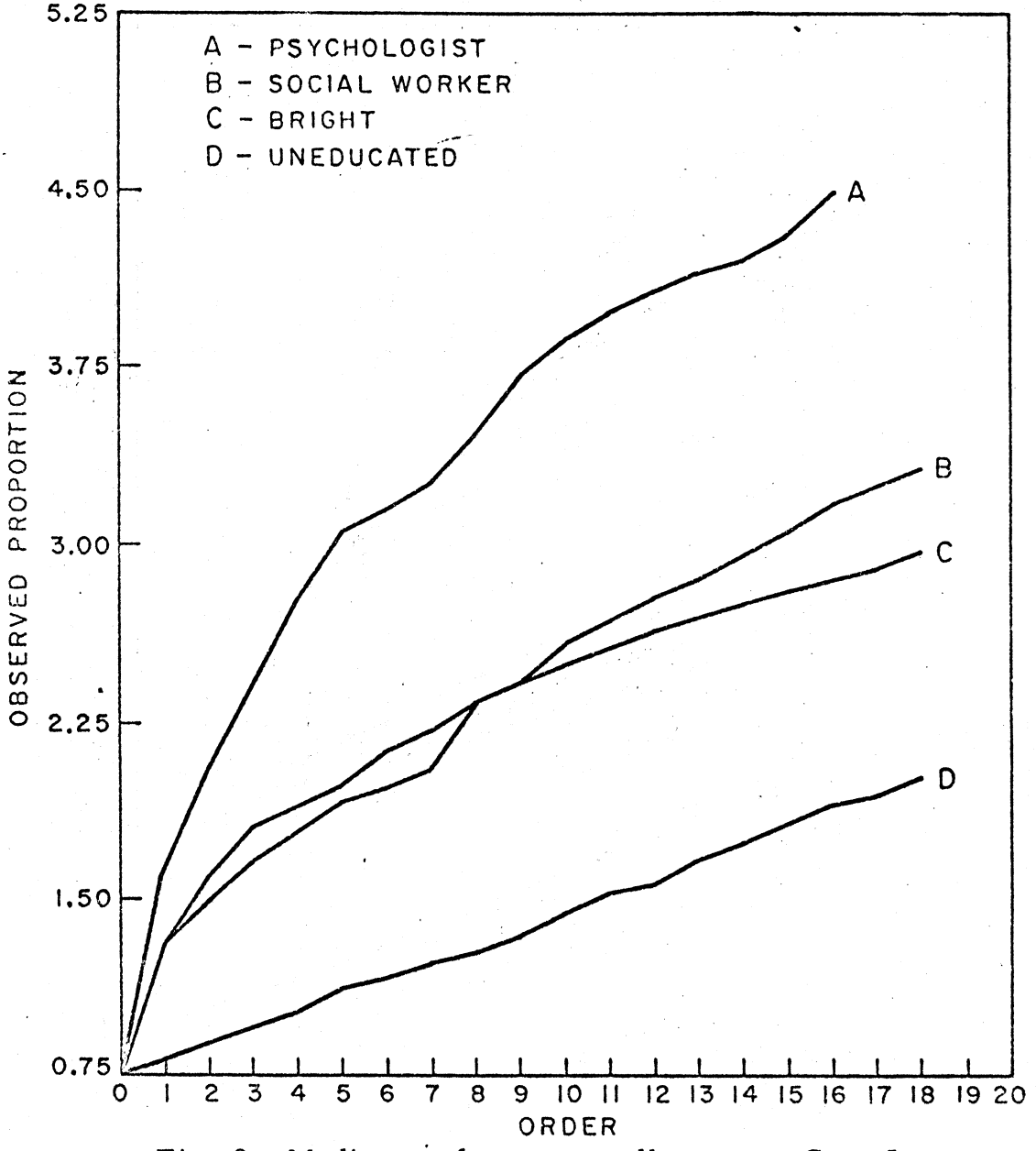


Fig. 9. Median performances all groups: Case I

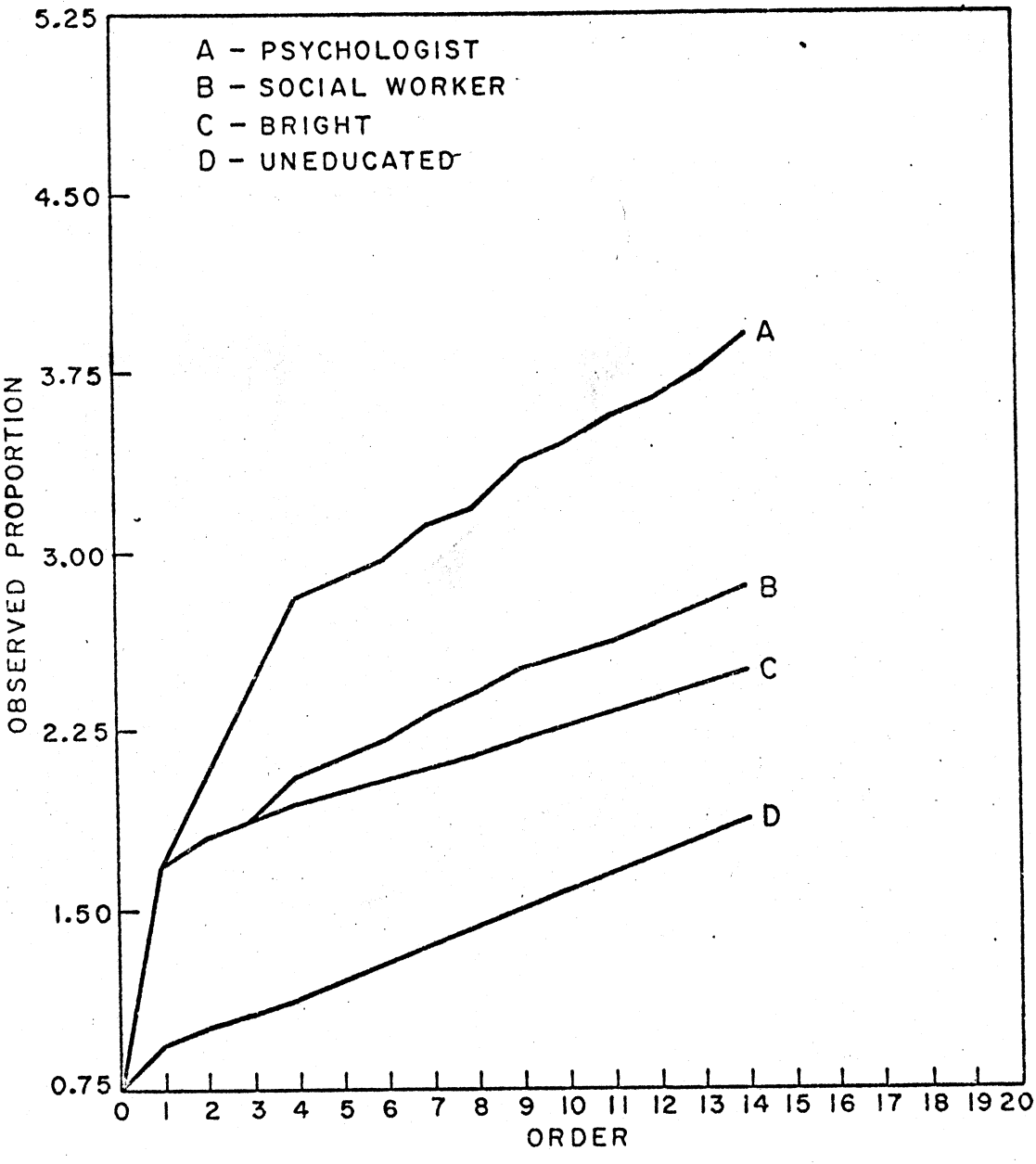


Fig. 10. Median performances all groups: Case II

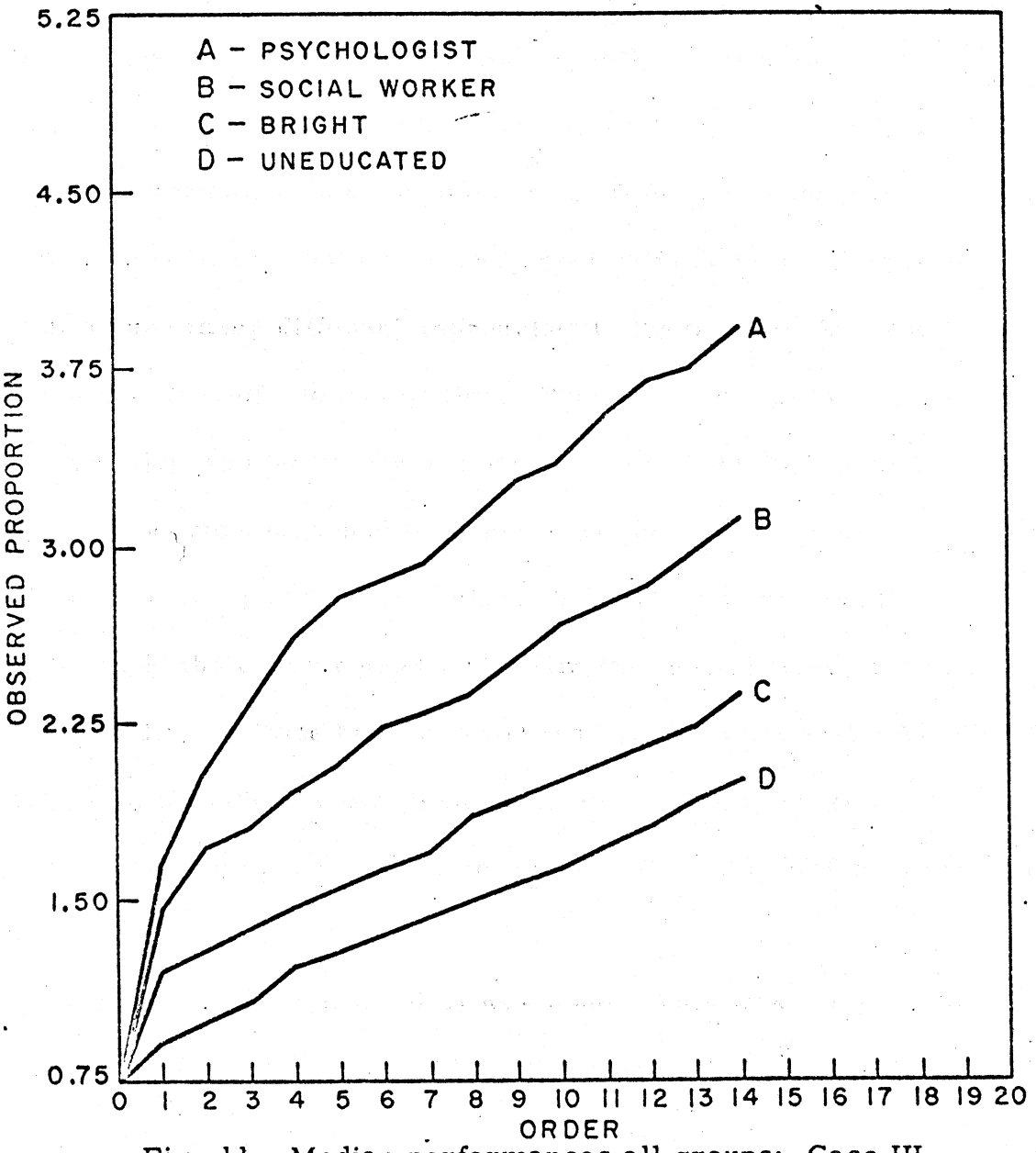


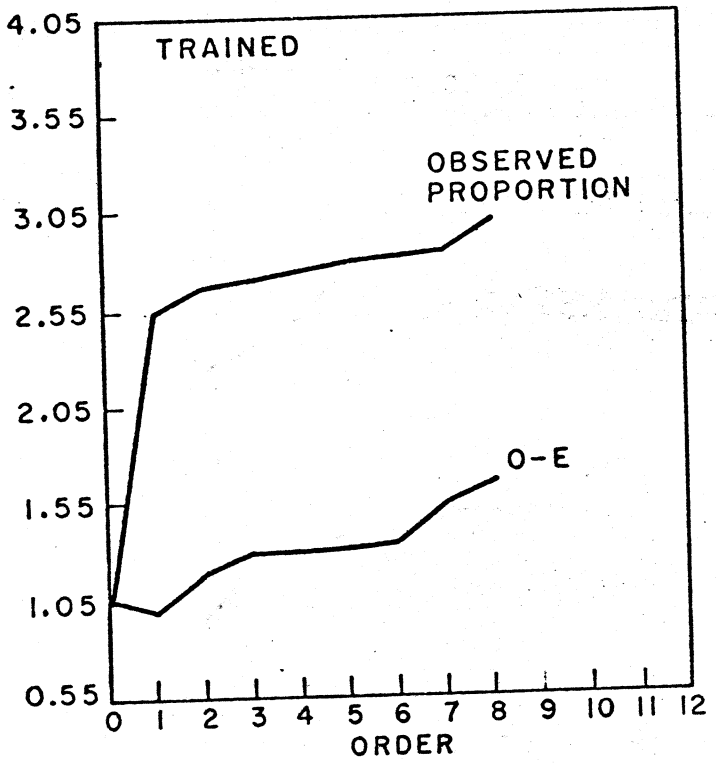
Fig. 11. Median performances all groups: Case III

of magnitude of the curves suggests that education and training do affect the manner in which people solve problems. One added feature about the four persons whose performances are plotted in the figures is that they all achieved similar answers. Yet it is quite obvious that the curves representing their performances are not the same. By way of casual observation it was noted that (though not extensively dealt with here) bright persons seemed to use many different approaches to the problem but usually stressed the area of communication. They felt, as a group, that where communication was faulty between people there must be a problem. The uneducated persons stressed income and social life predominantly indicating what they considered most important. Still, despite different approaches each "solved" the case or produced a similar answer (i.e., it was not possible to discriminate between workers by their answers). These results demonstrate that the Rimoldi technique can be used to discriminate the thought processes of various workers and to illustrate different approaches to the same problem.

Another analysis of the data was done. This was achieved by use of the Rimoldi-Haley technique, which allows one to plot a subject's performance not only by the observed proportions but also by the observed minus the expected value for each cell (O-E). The expected values were computed

from the table of frequencies by assuming no association (homogeneity). This is the complete technique of order analysis. Figure 12 shows the performances of one trained and one untrained psychologist, and Figure 13 shows the same for two social workers. The abscissa represents the performance to be obtained if there is no association between cards and order, and it can be seen, therefore, that the two untrained workers performed at a level similar to what one might expect from a purely random performance. The trained workers in both figures performed in a manner clearly different from randomness. Therefore, it can be said that the method of order analysis aided in further discriminating between the trained and untrained workers.

The performances of the neurotic subjects were so different that they could not be represented quantitatively. Each subject performed in his own unique fashion. However, this group more than any other misread cards. Individuals had a tendency to use the same approach in each case, even when the data did not warrant it, and because of this eight of the ten neurotic subjects selected over 80 cards. Finally, the group often took data and interpretated how the person that it applied to would feel about it. They did not ask for information that would have told them how that person felt. For example, one subject said that the couple with marital problems had a



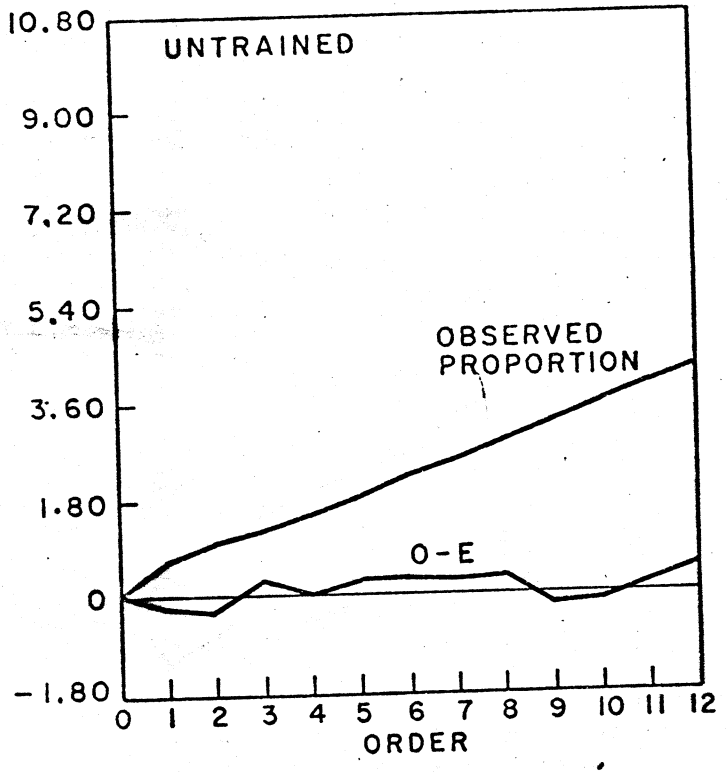


Fig. 12. Performance of a trained and untrained psychologist O-E: Case I

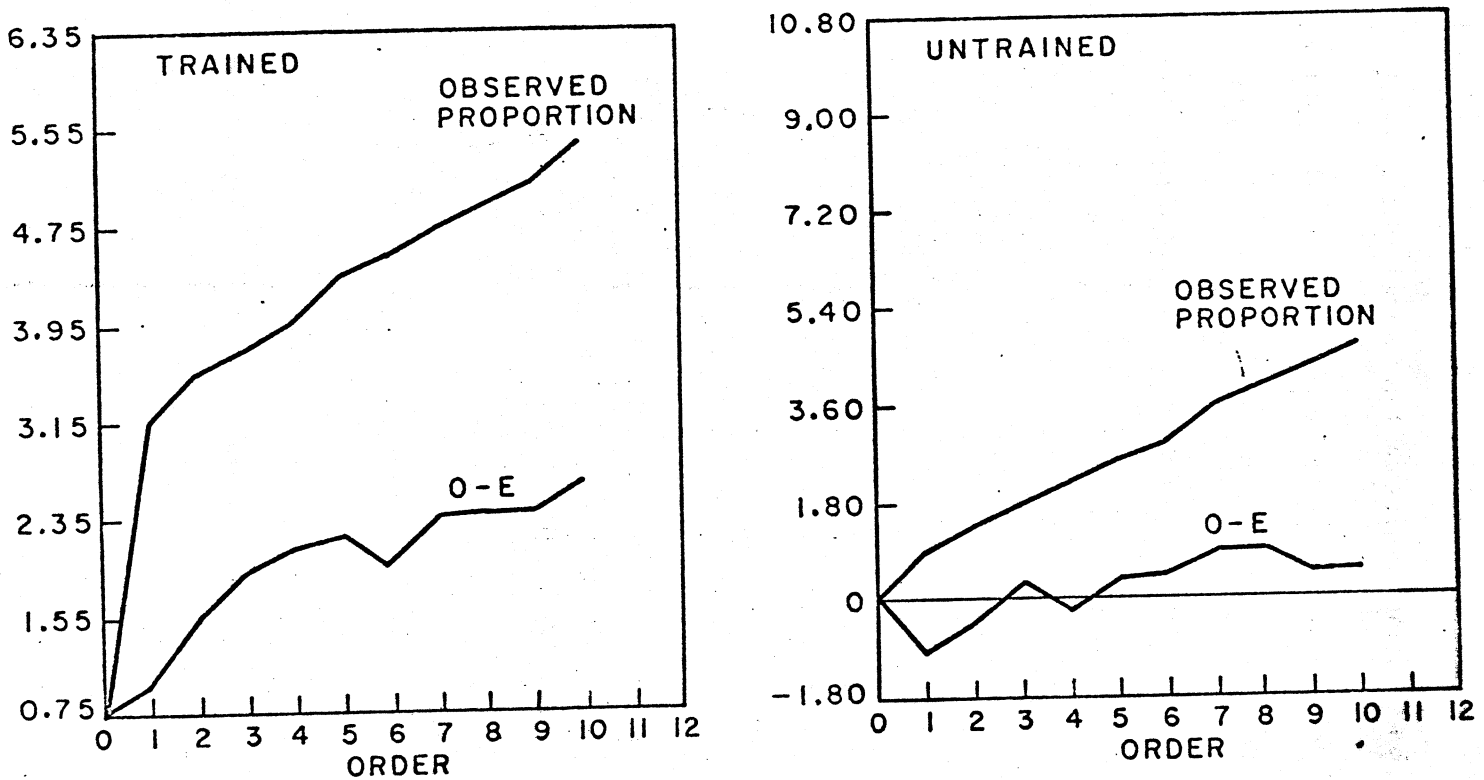


Fig. 13. Performance of a trained and untrained social worker O-E: Case I

religious problem because they were of different religious backgrounds. Available data indicated otherwise, but was never consulted. There were many other examples, too numerous to mention, which offer some indication that this technique can be used as a projective test. This might be a variable to be dealt with more thoroughly in another bit of research.

CHAPTER V

SUMMARY AND CONCLUSIONS

This study attempted to explore a new area, namely that of analyzing the thought processes involved in the solution of clinical problems. Many validation studies had been done, and a few workers had attempted to study processes indirectly by use of either introspection or retrospection; few have made the attempt using sound experimental conditions. The aim of this study was to attempt to gain direct knowledge of the thought processes involved in problem solving by use of a new technique. This technique was developed by Rimoldi for studying medical diagnosis, and an attempt was made to apply this technique to the area of clinical problem solving. It was hoped that it would be possible to differentiate the thought processes of various persons of different backgrounds by use of this technique. It was particularly hoped that it would be possible to differentiate the thought processes of trained and untrained workers and also those of different discipline. The author feels that in this respect the technique has proved that it can be applied to this area of study and has merit.

It was also found possible to apply this technique to analyze the processes of bright and uneducated subjects and, once again, make a discrimination. Some work was done with those diagnosed as neurotic, but unfortunately more subjects were needed in order to draw definite conclusions. Yet there was an indication that the technique might prove of value in this area also.

Unfortunately, the question of theoretical orientation could not be dealt with in this study because it was impossible to enlist the support of sufficiently large numbers of professional persons. This was particularly true with respect to those with specific orientation or trained in a particular theoretical position. This will present an area for future study.

No study answers all of the questions it starts out to answer, and this one is no exception; it raised more questions than it answered. However, the author feels that a start has been made and that the usefulness of the technique has been demonstrated. If this research has interested others in this technique's application in the clinical area--thereby stimulating further research--the author will feel that something has been accomplished.

APPENDIX I

ILLUSTRATION OF CARDS USED IN ANALYSIS

How Old Is This Child?

(front of card)

55.

Question: How Old Is This Child?

Answer: Eleven years old.

(back of card)

APPENDIX II

INSTRUCTIONS

Materials for the Test

Four sheets of paper are needed, one for each of the four cases. Please place a code number on each of the four sheets of paper to designate it as yours--no names please. Also, I would like your marital status, profession, years at that profession, school (years and degrees), and any theoretical orientation you may hold, e.g., Freudian, Adlerian, etc. On each sheet of paper place the number of the case (I, II, III) which you work out on that sheet.

Directions for the Test

You have before you a folder with a set of cards that provide information about various problem situations. Your first step should be to select the card labeled "problem card" appearing at the bottom of the second column. This card, when turned over, will present to you the problem you are to try to solve. The next step is to read all of the questions presented. These are the questions you can ask that will give you the necessary data to

understand the problem. After the questions are in mind you select your first card, turn it over, read the answer, and record the number of the card selected. This enables a record to be kept of both the order and the number of cards selected. After you select the first card, which determines where you begin to collect the information, you go on to the card you believe to be next most valuable and so on until you have enough data to write a short statement of what you feel the problem or problems are and any apparent causes of them. Select only those cards which you feel you need, and stop when you feel you have either reached an understanding of the case or reached a point of diminishing returns. This decision is completely up to you.

I would like to caution you against the feeling that you must understand all aspects of each case. That is impossible with the data you have available. Also, please be careful that you do not select cards only by place or numerical order, e.g., selecting them in an order of 1, 2, 3, 4, rather than for example numbers 120, 17, 63, 50, 2, etc.

Finally, let me thank you for your time.

APPENDIX III

TABLES OF OBSERVED PROPORTIONS

Table 2

Social Workers Case I

CARD NUMBER

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	.0011				.0011					.0023		.0011									.0103	
2										.0023	.0023		.0011								.0034	
3												.0011					.0011				.0023	.0011
4					.0023					.0011			.0046				.0011					.0011
5	.0011						.0023						.0011	.0011			.0046					
6						.0011					.0011				.0011		.0034					.0011
7		.0011						.0011			.0011						.0011				.0011	
8					.0011					.0011		.0011					.0023					
9		.0011									.0023	.0011									.0011	
10										.0011		.0011					.0011					
11													.0011									
12													.0011	.0011			.0011					
13									.0011								.0011					
14															.0011							
15																			.0011			
16														.0011								
17																						
18								.0023														
19					.0011						.0011											
20											.0023						.0011					

ORDER	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1				.0023				.0011						.0034								
2				.0115														.0011				
3				.0011																		
4				.0011																		
5		.0011			.0011			.0011														
6				.0011				.0011			.0011		.0023									
7					.0011								.0011	.0023	.0011				.0011			
8				.0011										.0011				.0023	.0011		.0011	
9														.0011				.0011	.0034			.0011
10					.0034				.0011				.0011				.0011	.0023	.0023			
11										.0023			.0011	.0011					.0011		.0011	
12									.0011	.0011				.0011			.0011		.0011			
13										.0023							.0023					.0011
14		.0011							.0011								.0011				.0011	.0023
15				.0011				.0011					.0011					.0023	.0011		.0023	
16										.0023								.0011	.0023			
17									.0011	.0011				.0011				.0011			.0011	
18					.0011													.0011	.0011			
19						.0011											.0011		.0011	.0011	.0011	
20				.0011																	.0011	

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1			.0137				.0046										.0011					
2				.0046		.0046	.0011														.0011	
3			.0069	.0023	.0023	.0034				.0046												.0011
4			.0046	.0011		.0023	.0011	.0011							.0011							
5							.0023	.0011			.0011											
6			.0011	.0011				.0023	.0023											.0011		
7				.0046			.0011	.0011	.0011			.0011										
8			.0011		.0011		.0011	.0011									.0023					.0011
9	.0011			.0011		.0011	.0011	.0011				.0011					.0011				.0011	
10	.0011	.0011	.0011				.0011								.0011				.0011			.0011
11	.0011	.0011		.0011				.0011	.0011						.0011	.0034			.0011	.0011		.0034
12			.0023	.0011									.0011		.0023		.0011		.0034			
13			.0011											.0011	.0011		.0011		.0011			
14												.0011							.0023			.0011
15																.0011						
16							.0023			.0011								.0011				
17	.0011			.0011				.0034	.0023		.0011								.0011			
18							.0011	.0023	.0011					.0011								
19	.0011											.0011					.0011					
20	.0011								.0023				.0011									

(Table continued on next page)

Table 2 continued

Social Workers Case I

CASE NUMBER

ORDER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1																							
2																							
3																							
4																							
5																							
6																							
7														.0023									
8														.0011								.0011	
9		.0011				.0011																	
10			.0011			.0011																	
11						.0011																	
12			.0011			.0011												.0011					
13					.0011	.0034											.0011						
14	0011		.0011			.0011																	
15						.0011																	
16												.0011											
17													.0011										.0011
18						.0011											.0011						
19		.0011																			.0011		
20			.0011	.0011							.0011			.0011		.0011							

ORDER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1													.0023		.0011					
2				.0011								.0011	.0011	.0057						
3												.0034	.0046	.0011	.0011					
4				.0046	.0034							.0023	.0069					.0011		
5				.0011	.0034							.0126	.0034	.0023						
6			.0011	.0023				.0011	.0023				.0034	.0034	.0023	.0011				
7				.0034	.0011				.0011	.0011		.0034	.0023		.0011	.0011				
8				.0023	.0046		.0011						.0023	.0046	.0011				.0011	
9				.0023	.0057							.0023	.0023					.0011		
10				.0034	.0011					.0011		.0023	.0011							
11				.0011	.0046		.0011			.0011		.0011	.0023							
12	.0011			.0023	.0011				.0011				.0023	.0011						
13				.0023						.0011						.0011				
14				.0011	.0023		.0011		.0011											.0023
15				.0011	.0023				.0011	.0023										
16						.0011	.0023				.0011								.0023	.0011
17							.0011	.0011	.0011		.0011									
18							.0011		.0011		.0011						.0011		.0011	
19								.0011		.0011		.0011					.0011		.0034	
20																				.0011

ORDER	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
1																					
2						.0011	.0023														
3						.0023	.0011			.0046											
4										.0011								.0094			
5			.0011				.0011												.0023		
6				.0011			.0023											.0011	.0023		
7						.0011	.0023								.0011			.0023			
8								.0011	.0023					.0011				.0011			
9	0011			.0011		.0011		.0034	.0011												
10							.0023		.0034	.0011											.0046
11				.0011		.0011		.0011												.0011	.0011
12	0011			.0011			.0011														.0011
13		.0011	.0011	.0011								.0023	.0011						.0011		
14	0023	.0011	.0011	.0011															.0011		
15		.0011					.0023					.0023		.0011			.0011				
16			.0011	.0011														.0011	.0011		.0011
17			.0011														.0011		.0011		
18												.0011			.0011				.0011		.0011
19		.0011																			
20								.0011			.0011						.0011				

NOTE: Observed Proportions (Pô)

Table 3

Social Workers Case II

CARD NUMBER

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1													.022									
2																		.022	.011			
3				.011																		
4					.011								.011									
5											.011								.011			
6											.011											.011
7											.011											
8											.022		.011					.022				
9																		.044				
10																						
11						.011																
12																		.011				
13							.011															
14																		.011				
15																	.011					
16											.011											
17																						
18																		.011				
19																						
20																						

ORDER	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1																						
2												.011										
3			.011																.011			
4					.011				.011													
5														.011								
6																				.011		
7						.011									.022							
8																	.011					
9																					.011	
10								.011									.011				.011	
11								.011													.011	.022
12								.011									.011		.011			
13																	.011					.011
14								.044							.011					.011		
15																			.022		.011	.011
16									.011									.011		.011		.011
17									.011			.011				.011		.011				.011
18								.011							.011		.022				.011	
19								.011							.011		.011					
20									.022										.011			

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1										.319	.011						.011					
2										.044	.099	.132									.011	
3											.055	.077	.011			.022						
4											.033	.044	.033			.044					.011	
5											.022	.033	.044		.022	.022	.033		.011			
6													.011			.033	.011	.011				
7										.011			.011				.011	.011			.022	.022
8										.011	.022	.011			.011							
9											.022		.011		.011	.011						
10												.022			.022						.011	
11						.011							.022		.011		.011	.011	.011			
12											.011		.011		.022	.033		.011	.011	.011	.011	
13											.022					.011		.022	.011	.011		
14											.011		.011			.011						
15												.011	.011	.011			.011	.011				.011
16											.011	.011					.011		.011			
17																						
18														.022						.011		
19																						
20																.011		.011			.011	

(Table continued on next page)

Table 3 continued

Social Workers Case II

CARD NUMBER

ORDER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1				.011																			
2			.033		.011	.011								.011									
3			.055	.044	.011	.011														.011			
4			.011	.011	.011	.022															.044		
5			.011	.044		.011																	
6		.011	.011	.022		.033		.011													.011		
7			.022	.011	.011																		.011
8	.011		.022	.011	.022	.011	.011		.011					.011							.011		
9		.011	.022	.033		.022	.011				.011						.011			.022	.011		
10			.011	.033			.011		.022					.011			.011		.022		.011		.011
11					.011	.011	.011		.011				.011		.011		.011		.011	.011	.011		
12			.011		.011	.033							.011	.022				.022		.011			
13		.011				.022								.022	.011				.011	.011		.011	
14	.011						.011		.011				.033	.022				.011			.022	.011	
15								.011	.011								.011		.022		.022		
16		.011					.011	.011				.022	.011	.011								.011	
17		.011				.011	.011			.011			.011	.022					.022				
18																			.011	.022	.011		
19						.011							.011		.011				.011	.022	.011		
20						.011	.011						.011					.011			011	011	

ORDER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1																	.011			
2																				
3																				
4		.011									.011									.011
5		.033					.011		.011											
6		.022					.022		.022		.011	.011	.022	.022						
7		.022					.011		.033		.033		.055	.011					.011	
8		.011							.011			.022	.011				.022			
9									.011				.011						.022	.011
10			.011			.011			.011				.022				.011		.011	
11			.022			.011								.011						
12							.011		.033				.011			.011		.011		
13			.011						.011		.011	.011	.011	.011						
14															.011				.011	.022
15							.011						.011			.011		.011	.044	
16							.022		.011					.011			.044		.011	.011
17			.011											.011			.011			.033
18							.011					.011	.011					.011		.011
19						.011							.011		.011					
20									.011		.011									

ORDER	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
1		.044							.011												
2	.011		.022		.011																
3		.011		.033			.022		.033							.011					
4				.033				.033	.011		.011									.011	
5		.011				.033			.011		.011	.033									
6		.011	.011	.011		.044			.011												.022
7			.011		.011				.033		.011									.011	
8		.011	.011				.022		.033			.022	.011							.011	
9				.011			.022					.022	.011				.011		.011	.022	.011
10			.033	.011				.011		.011	.022						.011				011
11	.011					.044			.011			.011	.011						.011		022
12							.011				.033										
13	.011		.022	.022																	022
14			.011	.011	.011	.022										.011					
15		.011			.011			.011			.011										
16			.011						.011											.011	
17	.011		.011	.011				.011			.011	.011								.011	
18	.011		.022		.011				.033				.011							.044	
19			.011	.011				.011				.022	.022						.011	.011	.011
20				.011	.011						.011		.022			.022					.011

Table 4.

Social Workers Case III

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1																	.012					
2																						.012
3															.012				.012			
4											.012								.012		.012	
5																						
6											.012				.012							
7										.012	.012			.012					.012			
8										.024												
9																						
10										.024												
11																						.012
12																						
13																						
14			.012																			
15						.012																
16								.012							.012							.024
17				.012																		.024
18	.012									.012												
19		.012									.012											
20		.012	.012											.032					.012			

ORDER	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1	.012		.024																			
2								.012														
3				.012			.012															
4											.012	.024										
5			.024						.012													
6		.012																				
7			.012																			
8						.012						.012	.024									
9							.024				.024			.024								
10																						
11																						
12																						
13																						
14			.012																			
15																						
16			.012				.024					.012										
17			.012												.012							
18																						
19																.012						
20																						

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1											.336							.012				
2											.024	.048	.060	.024						.012		
3										.012	.024	.012	.072	.012				.012	.012	.012		.024
4												.024		.072					.012		.024	
5													.024							.024	.012	
6			.012	.012										.012								
7			.012																.012	.012		
8			.012							.012	.012								.012	.012	.012	
9							.012				.012		.012	.012		.012	.012				.012	
10												.012	.012				.024		.012	.036	.012	.012
11																.012				.012		
12															.024					.012		.012
13						.012						.012								.012		
14												.012								.012		
15						.012										.012						
16			.012													.012						
17																.024	.024		.012			
18																	.012		.036			
19																	.036					
20																			.012			

Table continued on next page)

Table 4 continued

Social Workers Case III

ORDER	CARD NUMBER 67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1																							
2	.012							.024															
3	.012					.012																	
4		.012			.012	.012																	
5		.012			.012			.012															
6				.036	.024	.036																	
7		.024		.012		.024							.012										
8			.012					.024						.012					.012				
9	.012				.012						.012				.012		.012		.012				
10					.012						.012		.012			.012	.024				.024		
11			.012	.012	.024	.024	.012	.024							.012				.012				.012
12					.024		.060	.012			.012				.024	.012	.012						
13						.012	.024	.024			.012	.024			.024		.036						.024
14											.012	.036	.012				.036		.024				.024
15									.012		.012			.012					.024		.012	.024	
16	.012														.012				.012				
17												.012							.012	.012	.012		
18	.012					.012										.012					.012		
19										.024		.012					.012					.012	
20																							

ORDER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1																			.012	
2							.024						.024			.036				
3								.024					.012			.024				.012
4								.012		.012			.024	.024		.012			.012	
5								.012					.012	.024	.012	.036			.012	
6										.012			.024	.012	.012	.012			.060	
7			.036										.036				.012		.024	.012
8			.012						.024		.024		.036		.012				.036	
9											.012				.036	.024			.036	.012
10											.012	.048		.012	.024	.036		.024		.012
11						.012			.012		.012	.012		.024	.012	.036	.012		.012	
12	.012					.012			.012				.012	.048			.036			
13		.012							.012	.012				.024			.012			
14			.012							.024				.012	.024				.012	
15				.012					.060	.024				.024				.024		
16	.012						.012		.024			.012							.024	
17		.012										.012				.012				
18			.012									.012	.012		.012	.012				.012
19				.012					.012		.012			.012	.024				.012	
20									.012		.012	.012	.012			.012	.024	.012		.024

ORDER	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
1				.024								.024							.024		
2	.012		.024	.084	.012							.036									
3	.012		.036	.012							.012	.072									
4	.012		.012	.012		.012			.012				.036	.024					.024		
5	.012		.084	.048		.012		.012	.012					.024		.012	.024				
6			.024	.048				.012	.012	.012				.024			.012		.024		.012
7			.012	.012		.012	.012		.024				.012	.012		.012	.024	.012	.012		.036
8			.012	.012		.012		.012	.012		.036					.024	.012				
9			.012				.012	.012	.024		.012			.024	.012		.012				.012
10						.012					.024		.024			.012					
11	.012		.024						.036	.012		.012	.012				.012				.012
12			.024	.012			.012				.012			.024	.012				.012		
13			.012	.048											.048	.012			.012		
14									.012					.012					.012		.060
15							.012														.012
16						.024											.012				
17					.024												.024				.012
18			.024							.012			.024		.012						
19	.012			.012								.012									
20						.012				.024				.012							

Table 5

Psychologists Case I

CARD NUMBER

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1																					.124		
2																					.031		
3																	.015						
4																					.015		
5																							
6					.031												.046						
7										.015							.015						
8					.015				.015								.031						
9										.015		.015	.015				.015						
10																							
11												.015											
12																							
13			.015																				
14								.015															
15					.015												.031						
16			.015																				
17	.015																						
18																							
19					.015												.062				.015		
20																							

ORDER	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1																					
2			.124																		
3			.031																		
4																					
5			.015								.015										
6																	.015			.015	.015
7	.015											.015					.015				.015
8						.015		.015									.031				
9	.015											.015					.031			.015	
10							.015									.015		.015		.031	
11		.015									.015	.015								.015	
12																		.031		.015	
13																			.015	.015	
14									.031								.015			.031	
15																.015	.046			.015	
16				.015													.015			.015	.015
17																	.015				
18												.015					.015			.015	
19																.015	.015				
20			.015									.015								.015	

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1			.186																			
2						.046																
3			.015			.031																
4						.015											.015					
5			.031																			
6																				.015		
7						.015						.015										
8													.046		.015							
9												.015	.015					.015		.015		
10							.046					.046			.031					.015	.015	
11				.031		.031												.031			.015	
12							.015	.031											.015	.031		.015
13				.015								.015			.015				.046		.062	
14												.015			.031		.015				.015	
15										.015			.015				.015		.031	.015		
16															.015				.015		.031	
17																				.015	.015	
18		.015				.015								.031								
19	.015		.015					.015							.015							
20							.015													.031		

(Table continued on next page)

Table 55 continued

Psychologist, Case 1

CARD NUMBER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
	.015		.015						.031	.015													
						.031			.031	.031													
							.015					.015											
			.015															.015					
			.015			.015	.031				.015					.015							
			.015						.015		.015			.015		.015						.015	
												.015		.015					.015				
			.015											.015		.015			.015				

CARD NUMBER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
												.078								
				.062								.015	.078							
				.124	.015							.031	.031	.046						
				.046	.109		.015					.031	.078		.031					
					.015					.015		.031	.031	.124		.046				.015
				.015									.031	.015		.046				
	.015				.015					.015			.015	.015						
				.015			.015					.015								
			.015	.015	.015					.015			.015							
			.015	.015																
					.015															.015
			.015				.015			.015		.015				.015			.015	
			.031	.015		.015	.015			.015		.015	.015							
							.031			.031			.015			.015				
												.031		.015						
							.015					.031								
												.015								
	.031						.015													
	.015		.015																	

CARD NUMBER	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
																.031					
						.031															.015
									.015			.015									
	.015						.015	.031				.015				.031		.015			
				.031										.031		.015			.031		
	.015			.015		.031	.031							.031				.046			
	.031					.031								.015		.015		.015	.015		
	.015						.015	.015	.015								.015				
				.015			.015	.015		.031			.015		.015		.015		.046		
			.015			.015				.031								.015			
			.015				.046											.031			
			.015	.015		.031	.031	.015										.015			
							.015														
	.031						.015				.015		.015			.031					
			.015	.015		.015	.015				.015			.015	.015		.031		.015		
			.015	.031									.031	.015		.015		.015			
	.015		.031							.015											
		.015					.015							.015	.031	.015		.015			

NOTE: Observed Proportions (po)

Table 6

Psychologists Case II

CARD NUMBER

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1																						
2																						
3																						
4																						
5					.013																	
6																						
7				.013											.013			.013				
8					.013												.013					
9						.013																
10					.013		.013															
11				.013					.013						.013							
12		.013				.013																
13						.013	.013				.013											
14		.013																				
15									.013		.013											
16									.013													
17																						
18															.013							
19																.013						
20																	.013					

ORDER	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1																						
2																						
3																						
4																		.026				
5																						
6																						
7																						
8																				.013		
9																						
10													.013									
11																						
12																						
13																						
14		.013															.013					
15						.013		.013														
16		.013				.026														.013		.038
17		.013						.026							.013		.013				.013	
18		.013						.013												.013		
19								.013														
20													.013									.013

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1										.269	.013	.013										
2											.115	.077	.013				.051					
3											.090	.102	.026									
4											.013	.013	.115		.026						.026	
5													.038		.077	.051						
6													.038			.090						
7							.026				.026				.013						.013	.038
8		.013					.013									.013		.013				.013
9										.013									.038	.013		
10											.013		.013							.038	.013	
11										013						.013						
12											.013											
13																						
14																	.013				.013	
15																						
16																						
17																.013						
18																.013						
19		.013													.013							
20							.013									.013						

(Table continued on next page)

Table 6 continued

Psychologists Case II

CARD NUMBER

ORDER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1																							
2														.013									
3			.026	.013																	.013		
4				.038									.013										
5	.013		.026		.026	.013								.013	.013								
6	.013	.026		.013	.013												.013						
7	.013		.013		.026															.013			
8	.013			.026		.038		.013															
9				.013	.038									.013						.013			
10							.026					.013		.013							.013		
11						.013				.013				.026	.013						.026		
12			.013		.013								.013		.026						.013		
13																				.026		.013	
14			.013	.013	.013				.013											.013			
15			.013	.013	.013	.013																	
16					.013									.013					.026	.013			
17					.013	.013											.013		.013				
18				.013	.013	.026															.013	.013	
19				.013			.026						.013								.038	.013	
20			.013	.013		.026		.013	.038				.013			.013					.013		

ORDER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1													.013							
2											.013									
3													.013							
4		.013	.013								.026		.013							
5									.013										.013	
6									.013			.013	.013							
7									.013				.013						.013	
8		.013												.013					.064	.013
9						.026							.013		.013					.064
10									.026				.013	.013						
11									.026					.013	.013				.013	
12		.013							.013	.038		.026	.026			.013				.013
13									.064		.038		.038	.013	.013			.013		.013
14							.013					.038	.064	.038	.013	.013			.013	.013
15		.013			.013							.026	.013	.026	.026			.026		.013
16		.013									.013			.013	.038				.013	.038
17		.013	.026											.013	.013				.038	
18		.013	.013						.038				.013					.026		
19					.013	.013										.026	.013			
20					.013										.013			.013		.013

ORDER	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
1		.013																			
2			.013			.026															
3		.013																			
4			.013																		
5				.026																	
6		.013		.026	.013				.026												
7		.013	.013					.013	.026												
8			.013						.013												
9				.013	.013			.013													
10			.051	.013	.013			.013	.013												
11		.013		.026	.013				.026												
12					.026			.038													
13								.013													.013
14																					
15		.026											.013								
16				.013			.013													.013	
17		.038							.026											.013	.013
18											.013	.051								.013	.013
19				.026			.013													.038	.013
20			.013			.013							.013								.038

NOTE: Observed Proportions (Po)

Table 7 continued

Psychologists Case III

CARD NUMBER

ORDER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1	.030				.015																		
2	.030				.015																		
3					.015		.030																
4	.015				.015		.030																
5	.015						.015																
6						.030	.045														.030		
7						.045																	
8							.015																
9																							
10						.030																	
11							.015																
12					.015	.015					.015										.030		
13							.015								.015		.015	.015	.015			.030	
14											.015								.030			.030	.015
15					.015				.015		.015				.015				.030		.015	.015	.015
16	.015										.015				.030			.030				.015	
17																			.015		.015		.015
18											.030						.015		.015			.030	.015
19											.045									.015		.015	
20																				.030		.015	

ORDER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1															.030					
2		.015											.015		.015				.015	
3													.030			.075				.015
4		.015												.030	.015	.015				
5		.015					.015		.030			.015	.030		.015	.015			.015	
6						.015			.030		.015		.015			.015				.015
7		.015									.015							.015		
8		.015							.015		.030							.015	.015	
9		.030							.015		.030		.030		.030	.015		.015		
10			.015					.030					.015					030		.015
11		.015				.015		.030						.015	.015					
12		.015	.030										.030		.015	.015			030	
13			.015			.030		.015			.030									
14		.015	.015			.015				.015			.015	.015						
15			.015			.015							.015				.015		.015	
16		.015				.030		.015			.015				.015					
17								.015	.015		.015		.030		.015	.030			.030	
18		.030	.015							.030			.015	.030		.030	.015		.015	
19			.015							.015		.060	.030				.015		.015	
20			.015			.015			.015						.045		.030		.015	

ORDER	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
1			.045																		
2				.075		.015															
3			.045									.015									
4				.135		.015			.015			.030									.015
5			.120				.015										.015		.015		
6				.015		.015			.015					.015		.060	.015		.015		
7	.015		.015			.045		.015				.015		.015		.045	.075				
8			.015	.015					.060	.045	.015	.015		.045		.015	.015				
9			.030	.015		.030			.030		.015			.045		.015	.015				
10				.030				.045							.045		.015		.015	.030	.030
11			.060		.015						.015	.015		.015		.015		.015	.015		.030
12				.015	.015			.030	.015						.015		.015			.015	.030
13									.030				.015	.015							.045
14								.015					.030	.015				.015	.015		.015
15						.015	.060														
16						.060	.015					.015				.015					.015
17					.030		.015	.015						.030			.015				
18						.015	.015			.015				.015		.015	.015				
19			.015					.015									.015		.015		.045
20												.015				.015	.015				.030

NOTE: Observed Proportions (Po)

Table 8

Bright Subjects Case I

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1																					.012	
2			.006																		.012	
3					.006			.006														
4	.006										.012											
5																					.006	
6											.006											
7								.006														
8																						
9																.006						
10															.006							
11										.006							.006					
12																	.006					
13																					.006	
14																						
15																						
16																						
17																						
18			.006																			
19								.006														
20															.006							

ORDER	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1				.006																		
2				.012																		
3				.006									.006									
4																						
5			.006																			
6				.006														.006				
7																						
8																						
9																	.006					
10																						
11																						
12																						.006
13																			.006			
14				.006																		
15					.006													.006				
16									.006												.006	
17										.006												
18																						
19																						
20																						

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1			.018																			
2							.006															
3			.012																			
4				.006																		
5			.006	.006																		
6			.006		.006			.006														
7					.006		.012														.006	
8								.012														
9																						
10																						
11								.006														
12									.006						.006							
13						.006																
14																						
15																						
16																						
17		.006																				
18																						
19																						
20																						

(Table continued on next page)

Table 8 continued

Bright Subjects Case I

ORDER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
1																																				.018	.006																													
2																											.012										.006	.006																											
3																												.006									.006	.006																											
4																											.018		.006									.006																											
5																												.006							.006																			.006										
6																																			.006																			.006										
7			.006																								.006												.006																											
8																	.006										.006	.006						.012		.006		.006																											
9						.006																						.006							.012	.012																											
10																								.006		.006								.006	.006				.006																									
11																																					.006			.006					.012																			
12																																		.006																											.006		
13																													.006																															.006		
14			..006																																																													
15																																																																	
16																																																																
17																																																																
18																											.006																																					
19																													.006																																		
20																																	.006																															

NOTE: - Observed proportions (Po).

Table 9

Briht Subjects Case II

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1																						
2																						
3																						
4									.059													.177
5			.059																			
6																		.118				
7																						
8																						
9					.059																	
10																						
11																						
12																						
13									.059									.059				
14										.059												
15																						.059
16																				.059		
17																						
18																						.059
19																						
20						.059																

ORDER	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1																						
2																						
3																	.059			.059		
4																						
5															.059							
6																	.118					
7									.059								.059		.059			
8			.059																			
9								.059						.059								
10															.059							
11																						
12																						
13														.059								
14																				.059		
15																						
16															.059							
17																						
18																						
19					.059																	
20																						.059

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1										.295	.177		.059									
2										.059	.295	.118										
3												.118				.118						
4													.059									
5														.059		.059						
6																						
7										.059										.059		
8																					.059	
9													.059									
10											.059		.059									
11																				.059		
12																						
13																						
14																						
15													.059								.059	
16																						
17																.059	.059					
18																						
19																						
20																						

(Tab continued on next page)

Table 9 continued

Eight Subjects Case II

CARD NUMBER

ORDER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1																							
2																							
3			.059																				
4				.059		.059		.059															
5			.059		.059								.059										
6		.059								.059													
7			.059																				
8			.059	.059		.059			.059											.059			
9					.059									.118									
10						.059																	
11																			.059				
12													.059										
13																					.059		
14			.059																				
15																							
16										.059										.059			
17								.059												.059			
18																				.059			
19																					.059		
20																							

ORDER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1																				
2														.059						
3											.059									
4											.059									
5														.118						
6													.236							
7																				
8																				
9																				
10												.059	.059							
11																			.059	.059
12							.118													
13														.059						
14							.059						.059							
15								.059												
16									.05											
17												.059								
18		.059							.05				.059							
19							.059													
20																				

ORDER	110	111	112	113	115	116	117	118	119	120	121	122	124	125	126	127	128	129	130
1					.059														
2					.059														
3									.059					.059					
4								.059											
5			.059																
6																			
7	.059		.118																
8					.059														.059
9																		.059	
10																			.059
11						.059		.059											
12			.059																.059
13																			
14																			
15	.059																		
16																			
17																			
18																			
19			.059											.059					
20				.059															

Table 10

Bright Subjects Case III

CARD NUMBER (cards 1–22)

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1																						
2																			.056			
3																						
4															.056							
5															.056							
6									.112													
7						.056			.112	.056												
8																						
9																						
10																						
11																						
12																						
13																						
14			.056																.056			
15										.056												
16											.056	.056										
17															.056							
18											.056											
19																						
20											.056											

CARD NUMBER (cards 23–44)

ORDER	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1																						
2																						
3																						
4																						
5																.056						
6																			.056		.056	
7															.056							
8	.056											.056							.056		.056	
9								.056														
10																						
11																						
12																						
13														.056								
14																						
15																						
16																				.056		
17																						
18																			.056			
19																						
20																						

CARD NUMBER (cards 45–66)

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1											.392											
2												.112	.056							.056		
3																.056			.112			
4											.056			.056								
5							.056					.056										
6																						
7																						
8					.056																	
9									.056													
10											.056											
11																						
12													.056									.056
13																						
14																						
15							.056															
16																						
17																						
18																						
19																.056						
20																.056						

(Table continued on next page)

Table 10 continued

Bright Subjects Case III

CARD NUMBER

ORDER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1																							
2																						.056	
3	.056				.056																		
4					.056																		
5							.112																
6					.056		.056																
7									.056														
8					.056				.056														
9							.056													.168			.056
10																.056	.056						.056
11		.056					.056												.056				
12													.056										
13																							
14									.056														
15																							
16																							
17																							
18																							
19																							
20																				.056			

ORDER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1																				
2																.112				
3													.056		.056					
4										.168			.056			.056	.056			
5												.112								
6													.112	.056						
7																			.156	
8			.056													.056				
9		.056								.056	.056									
10									.168				.056							
11									.056				.056		.056				.168	
12														.056					.056	
13			.056												.056					
14												.056								
15						.056								.056			.056			
16																				
17												.056							.056	
18																	.056			
19																		.056		
20																				

ORDER	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
1	.056		.056									.056									
2			.056	.056																	
3			.056	.056					.056												
4																					
5	.056															.056					
6																	.056				
7			.056											.112							
8												.056									
9																					
10																			.056		
11				.056																	
12												.056							.056		.168
13			.056	.056						.056			.112		.056					.056	
14												.112		.056		.056					.056
15		.056															.056				
16			.112	.056																	
17					.056									.056							
18							.056														.056
19		.056															.056				
20																					

Table 11

Uneducated Subjects Case I

CARD NUMBER

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	.006		.006		.006					.006	.006	.006					.018					
2	.006										.012	.012		.006								.012
3										.012		.006					.006			.006		
4	.006								.006			.006					.006					
5																			.006			.006
6			.006								.006						.006				.006	
7																						
8								.006														
9																						
10																						
11																						
12														.006								
13																						
14																						
15																						
16																						
17																						
18																						
19																						
20																						

ORDER	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
1								.006														
2																		.006				
3									.006													
4	.006			.006									.006									
5		006				.006																
6	.006							.006					.006									
7				.006				.006			.005		.006		.006							
8	.006																.006	.006				
9						.012																
10						.006																
11						.006						.006										
12																						
13																						
14																						
15																						
16																						
17																						
18																						
19																						
20																						

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1										.006												
2				.006				.006	.012													
3				.006		.006																
4																.012	.006					
5																	.006					
6														.006			.006					.006
7															.006						.006	.006
8	.006			.006																		
9							.006		.006							.006					.012	
10				.006		.006									.006							
11				.006				.006														.006
12							.006															
13									.006													
14																	.006					
15										.006												
16																						
17																						
18																						
19																						
20																						

(Table continued on next page)

Table 11 continued

Uneducated Subjects Case I

CARD NUMBER

ORDER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1																							
2																							
3																							
4					.006																		
5	.006																						
6					.006												.006						
7																							
8	.006																						
9												.006										.006	
10										.006													.006
11		.006															.012						
12												.006									.006		
13					.006								.006								.006		
14	.006					.006														.006	.006		
15																							
16																							
17						.006																	
18														.006									
19																.006							
20																						.006	

ORDER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1																				
2																				
3																				
4																				
5				.006																
6																				
7				.006		.006														
8																				
9																				
10																				
11										.006										
12																				
13		.006							.006											
14											.006									
15					.006					.006	.006		.006		.006				.006	
16															.006	.006				.006
17												.006								
18																				
19																				
20																				

ORDER	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
1																					
2																					
3																					
4																					
5												.006									
6																					
7																					
8				.006														.006			
9				.012											.006						
10			.006																		.006
11																					
12				.006									.006								
13													.006								
14			.006																		
15																					
16		.006											.006								
17	.006					.006															
18									.006	.006										.006	
19						.012															
20																					

NOTE: Observed Proportions (Po)

Table 12

Uneducated Subjects Case II

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1											.058		.232						.058			
2																	.058	.016		.016	.058	
3											.058			.058							.058	
4										.058								.058	.058			
5											.058						.058	.058				
6			.058								.058						.058					
7										.058									.058			
8										.058												
9																						
10																						
11																						
12																						
13																						
14																						
15																						
16																						
17			.058																	.058		
18																						
19																						
20																						

ORDER	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
	CARD NUMBER																					
1																						
2					.058															.058		
3						.058																
4					.058									.058			.058					
5									.058	.058			.058	.058		.059						
6				.058					.058											.058	1058	
7													.058		.116							
8													.058			.116						
9																					.058	
10								.058														
11																						.058
12																						
13														.058								
14																.058						
15																				.058		
16																						
17																						
18																						
19			.058																			
20																						

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1																		.058				
2																						
3		.058						.058														
4																						
5								.058														
6			.058					.058		.058												
7		.058	.058									.058										
8										.116				.058	.058							
9										.058			.058		.058					.058	.058	
10																						
11													.058							.058		
12																.058						
13						.058																
14																						
15								.058														
16										.058												
17																						
18																						
19																						
20																						

(Table continued on next page)

Table 12 continued

Uneducated Subjects Case II

CARD NUMBER

ORDER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1																							
2			.058																				
3											.058												
4																							
5																							
6																							
7			.058																				
8						.058												.058	.058				
9											.116		.058									.058	
10			.116								.058	.116	.058					.058					
11				.058		.058		.058														.174	
12											.058							.058				.058	
13			.058																	.058	.058		
14								.058													.058		
15																				.058			
16													.058										
17																			.058				
18																							
19																							
20																							

ORDER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1																				
2																				
3																				
4																				
5																				
6												.058								
7									.058											
8		.058																		
9								.058												
10																				
11																				
12																				
13								.058	.058		.058									
14											.058									.058
15										.058		.058								
16											.058		.058		.058					.058
17															.058					
18															.058					
19											.058									
20															.058					.058

ORDER	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
1																					
2		.058																			
3			.058																	.058	
4																					.058
5																					
6																					
7																					
8																					
9																					
10																				.058	
11					.058																
12		.058							.058												
13		.058																		.058	
14				.058																	
15			.058	.058																	
16			.058																		
17	.058								.116	.058											.116
18											.058										
19								.116		.058											
20			.058			.058								.058							.058

Table 13

Uneducated Subjects Case III

CARD NUMBER

ORDER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1		.053							.053	.106					.053	.106						
2										.159			.053				.106					
3											.053						.053					
4																		.053			.053	.053
5																						.106
6																						.053
7			.053																			
8								/053							.053							
9																						
10																						
11																						
12					.053																	
13																			.053			
14																						
15																						
16																						
17																						
18																						
19																						
20																						

ORDER	23	24	25	26	27	28	29	30	31	2	33	34	35	36	37	38	39	40	41	42	43	44
1							.053				.053											
2				.053							.053											
3		.106		.053	.053															.053		
4					.053	.053	.053								.053							
5		.053	.053			.053			.053		.053											
6	.053	.053		.053									.053							.106		
7									.053		.106											.053
8							.053															
9																			.053			
10																						
11																						
12																						
13																						
14						.053																
15																						
16																						
17																						
18																						
19																						
20																						

ORDER	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
1																		.053				
2											.053											
3			.053		.053																	
4								.053						.053								
5									.053					.053								
6											.053			.053								
7									.053					.053						.053		
8					.053													.053				.053
9									.053		.053										.053	
10											.106											
11												.053								.053		
12															.053							.053
13																		.053				
14																				.053		
15																						
16																						
17																						
18																						
19																						
20																						

(Table continued on next page)

Table 13 continued

Uneducated Subjects Case III

CARD NUMBER

ORDER	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89
1																							
2																							
3			.053																				
4											.053												
5															.053								
6																.053							
7														.053						.053			
8								.053			.053									.053	.053		
9					.053						.053										.106		.053
10								.106			.053						.053						.106
11					.106										.053								
12	.053								.106														
13								.053			.053	.053											
14				.053													.053			.053			
15												.053						.058					
16																	.053						
17																				.106			
18																							
19																							
20																							

ORDER	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																	.053			
9													.053							
10								.053												
11	.053								.106	.053									.106	
12									.053				.053							
13		.053														.053				
14													.053							
15														.053						
16																				
17					.053												.053			
18																				
19									.053				.053						.053	
20																				

ORDER	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
1																					
2																					
3																					
4																					
5																					
6																					
7																					
8																					
9																					
10			.053																		
11							.053														
12		.106													.053						
13												.053									.159
14					.106	.053			.053			.053									.053
15		.053					.053		.053					.053	.106						
16								.053	.053												.053
17						.053			.053											.106	
18			.106							.053											.053
19													.053							.053	
20																					

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APPROVAL SHEET

The dissertation submitted by Harry E. Gunn has been read and approved by five members of the Department of Psychology.

The final copies have been examined by the director of the dissertation and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the dissertation is now given final approval with reference to content, form, and mechanical accuracy.

The dissertation is therefore accepted in partial fulfillment of the requirements for the Degree of Doctor of Philosophy.

January 15/61
Date

Signature of Adviser